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AN EVALUATION OF A NONGRADED SECONDARY SCHOOL. FINAL REPORT.
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THE EFFECTIVENESS OF A NONGRADED HIGH SCHOOL WAS COMPARED WITH THAT OF A TRADITIONALLY GRADED HIGH SCHOOL IN THE SAME CITY BY ADMINISTERING TESTS AND RELATED EVALUATION METHODS TO A RANDOMLY SELECTED SAMPLE GROUP OF 141 TENTH-YEAR STUDENTS AT EACH OF THE SCHOOLS. SIX STUDENT GROUPS FOR EACH SCHOOL (DISTINGUISHED BY SEX AND ABILITY LEVEL) WERE USED TO COMPARE THE SCHOOLS ON SEVEN DEPENDENT VARIABLES REGARDING STUDENT ACHIEVEMENT, ATTITUDES, AND CRITICAL THINKING. ANALYSIS OF VARIANCE WAS APPLIED TO 63 HYPOTHESES, BASED ON THE ASSUMPTION THAT STUDENTS' RECORDS AT THE NONGRADED SCHOOL WOULD DIFFER SIGNIFICANTLY FROM THOSE AT THE GRADED SCHOOL BECAUSE OF THE NONGRADED SCHOOL'S DISTINCTIVE VERTICAL AND HORIZONTAL ORGANIZATION. NO SIGNIFICANT DIFFERENCES BETWEEN THE TWO SCHOOLS WERE FOUND WITH RESPECT TO GAIN IN READING COMPREHENSION, GAIN IN MECHANICS OF ENGLISH, ATTITUDES, OR CRITICAL THINKING ABILITY. GRADED STUDENTS GAINED SIGNIFICANTLY MORE IN MATHEMATIC REASONING THAN NONGRADED STUDENTS. THE OVERALL INTERACTION EFFECT BETWEEN THE SCHOOLS AND SEX AND BETWEEN THE SCHOOLS AND ABILITY LEVEL WAS NEGLIGIBLE. (JK)

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December 1967

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Utah State University

Logan, Utah 84321

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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Bob W. Steere

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ABSTRACT

A Comparative Study of a Nongraded and Graded Secondary School as to Achievement, Attitude, and Critical Thinking Ability

by

Bob F. Steere, Doctor of Education

Utah State University, 1967

Major Professor: Dr. Homer H. Johnson
Department: Educational Administration

Purpose

The purpose of this study was to complete a systematic study of a nongraded secondary school in order to help solve the problem of having too few evaluations of nongradedness. This was done by comparing a first year nongraded school with a control high school of the same city. The hypotheses were based on the assumption that the type of vertical and horizontal organizations of the nongraded school would significantly influence students achievement attitudes, and critical thinking ability.

Procedure

Sample groups, which numbered 141 for both the nongraded and the graded schools, were randomly selected from the tenth year students. The students were then stratified by sex and placed by I. Q. scores into one of the three ability groups designated as low-ability, average-ability, and high-ability. The combination of sexes and ability levels produced six different comparison groups for both schools which were used for comparing the schools on seven dependent variables: three achievement variables, three attitudinal variables, and one relating to critical thinking. Test for these seven variables were administered both in early October of 1966 and late April of 1967 for the purpose of obtaining and comparing the gain scores. Analysis of variance was employed for obtaining the mean gains and for obtaining F ratios used to detect significance in total-school comparisons and significant interaction effects. Means of like-groups were compared by using the t test to determine whether the group differences reached the .05 level of significance. In the case of interaction hypotheses and total-school hypotheses, F values reaching the .05 level were recognized as being significant.

Findings and conclusions

1. There is no significant difference in the gain in reading comprehension (CAT) when comparing students attending a nongraded high school with students attending a graded high school.

2. There is a significant difference in the gain in mathematic reasoning (CAT) when comparing students attending a graded high school with students attending a nongraded high school. The graded students gained significantly more than did the nongraded students.

3. There is no significant difference in the gain in mechanics of English (CAT) when comparing students attending a nongraded high school with students attending a graded high school.

4. There is no overall significant difference between the attitudes of the graded and nongraded students in that only two of the attitudinal comparisons proved to be significant and none of the three total-school comparisons was found to be significant.

5. There was no significant difference in the critical thinking ability of the graded and nongraded students in that none of the six comparisons proved to be significant.

6. In that only one of the fourteen interaction hypotheses was found to be significant, it is concluded that the overall effect due to interaction between the schools and sex and between schools and ability level was negligible. The one significant interaction effect was found between the school and the ability level on the variable of educational value.

Recommendations

The recommendations were as follows: (1) the number of course offerings in the nongraded school should be greatly reduced to allow teachers to develop and coordinate materials and methods for two or three sequential phases of one course instead of becoming specialized in several isolated courses, (2) the analysis of variance technique used in this and similar studies should be replaced by analysis of covariance when a computer program becomes available which can employ covariance in a three-way factoral design with unequal cells (groups), (3) that attitudes be measured only once towards mid-year of two consecutive years due to the tendency for attitudes to become less favorable between fall and spring testing, (4) that readers of this study not conclude, due to the lack of significant gains, that the nongraded movement be abandoned, and (5) that the nongraded school, the U S Office of Education, and Utah State University continue to cooperate and extend this study over a three-year period before concluding the worth of the nongraded program.

(145 pages)

INTRODUCTION

Origin and Nature of the Problem

Now, more than at any other time in the history of American education, the nation's citizenry is overtly voicing their opinions on education. Laymen and educators alike are recognizing that the ultimate in learning opportunities are not yet available to our youth. This recognition has been largely brought about by the "space race" and the critical writings of influential personalities. In addition, federal monies have provided a stimulus for educators to seek better methods for educating our youth.

Some modern pedagogical methods have been recognized as more congruent with learning theories but have been deemed inconsistant with the vertical graded organization of the American school. Teachers and administrators alike recognize that the variations in abilities, achievement, and interests of children who are assigned to the same grade level are not being adequately provided for but accept current practices as being the most congruent with the schools' organization. Writers such as Guggenheim are encouraging educators to strive for a higher degree of excellence through the principle of individual differences. "If we accept the principle of individual differences,"wrote Guggenheim, "we must also accept the principle of differentiated education." (1966, p. 184) Many of our secondary administrators and faculties are experimenting with innocative materials and methods in an attempt to provide for individual differentiations. A few secondary administrators have recently made an effort to eliminate the compression of individual differences by removing grade level designations and opening the total curriculum to all pupils regardless of their chronological age or years spent in school. These high schools are being identified as "nongraded schools".

Goodlad and Anderson (1956, p. 59) have emphasized the point that, "The nongraded plan is a system of organization and nothing more." It is, they contend, "no panacea for problems of curriculum and instruction." But most educators and pedagogical writers who have worked with nongrading are enthusiastic about it and hold that it provides for better education. They speak of higher achievement, improved mental health and attitudes, and other possible benefits. Since these educators are advocating that a nongraded curriculum will provide a better educational environment and in that several secondary schools are either developing or have developed nongraded curricula, there exists a need to evaluate the effectiveness of the nongraded secondary schools.

Significance of the Problem

Although numerous testimonials of the effectiveness of the nongraded high school are available and several studies of nongraded elementary schools have been completed, available literature reveals only one recently completed study investigating the relative effectiveness of a nongraded high school. Educators linked to nongrading and other innovative endeavors have not recognized a strong need to systematically evaluate the merit of these new practices. Carlson (1965, p. 5) emphasizes this point by saying, "It is rare indeed when an educational innovation is backed by solid research."

Carbone (1961, p. 15) points out the need for more evaluation of nongraded schools by stating, "Those persons concerned with the effectiveness of nongrading have been aware of the dearth of evidence available to support advocacy of this plan of organization." Goodlad and Anderson (1963, p. 57) also acknowledge the lack of research as related to nongradedness by suggesting that, "Perhaps one would be closer to the truth if he were to say there is not evidence to suggest anything. We have little more than inadequate firsthand impressions to go on."

Statement of the Problem

The nongraded high school is a recent attempt to more effectively meet the individual differences of students. But a problem exists in that the innovation has been accompanied by little systematic evaluation for judging its merits. It is the purpose of this study to help alleviate this problem by comparing the achievement, attitudes and critical thinking ability of students attending one of the few existing nongraded high schools with students attending a graded high school.

Definition of Terms

Throughout the context of this study, the following definitions of terms will be applied:

Achievement

The accomplishment or proficiency of performance in a given body of knowledge as measured by the Advanced California Achievement Tests.

Critical thinking ability

The capacity to draw correct inferences, recognize assumptions, draw appropriate deductions, interpret data, and evaluate arguments.

Horizontal organization

The design which serves the function of allocating pupils to available teachers (Goodlad and Anderson, 1963, p. 210). This is accomplished by various grouping methods.

Nongrading

The organization of a school based on a number of achievement levels (phases) in each subject rather than by traditional year in school or grade level. The removal of grade level is a vertical reorganization and the phasing of individual courses involves both vertical and horizontal reorganization.

Phasing

The division of courses or subjects into various achievement levels. Courses may have one to five phases, depending on the nature of the course. Phase I, for example, is designed for students lacking basic skills, whereas Phase V is designed for students with exceptional achievement.

Student attitude

A somewhat lasting emotional disposition that is attached to insights, interpretations, opinions, and actions. Attitudes are both favorable and unfavorable and associated with pleasant and unpleasant feelings. (Blackburn, 1962, p. 8).

Ungraded

A synonymous term to the word nongraded.

Vertical organization

The design which serves the necessary school function to moving pupils upward. The design may be graded or nongraded.

Limitations of the Study

The study was originally designed with analysis of covariance as the statistical technique but a suitable computer program which would provide for unequal sizes of the cells (groups) was not available. A covariance program for equal size cells was available but to use such a program would have necessitated a substantial reduction in the number (N) of some cells in order to make the comparison groups of the two schools equal in size. In some cases this would have reduced the group number by 36 per cent. The writer felt that the advantage of covariance would not justify such a sample reduction and, therefore, the covariance program was replaced by analysis of variance. Indeed, in studies which use the classroom as a laboratory, controlling the many variables is difficult if not impossible. This statement is not meant to de-emphasize the need to control and equate variables but to stress the point that the use of aexperimental study methods are an intergral part of this field study. Guba (1965, p. 15) shares these sentiments by stating that:

> . . . components of an educational invention may, particularly in the design stage, profit from study under laboratory conditions, but the final and most meaningful evaluation must be made in the field with intentions and under conditions that made the aexperimental mode more meaningful.

The assumption has therefore been made that the two educational environments of this study are equally effective except for differences that may be caused by the graded and nongraded organization of the two schools. In addition, this study was limited to approximately 140 tenth year students from the two schools who are assumed to be representative of the total school population from which the necessary data was accumulated.

Research Hypotheses

The hypotheses tested in this study were based on the assumption that the type of vertical and horizontal school organization as used by the nongraded high school would significantly influence student achievement, attitudes and critical thinking ability. In light of the positive gains of other nongraded schools as revealed by the review of literature the researcher felt obligated to structure the hypotheses to favor the nongraded school.

Specifically, these research hypotheses are:

(1) Students attending a nongraded high school will gain significantly more than students attending a graded high school when compared in (a) reading comprehension, (b) mathematical reasoning, and (c) mechanics of English as measured by subtests of the California Achievement Test.

(2) Students attending a nongraded high school will gain significantly more than students attending a graded high school when compared in (a) attitude toward teacher, (b) attitude toward the educational program, and (c) opinion about the importance of education (educational value) as measured by the subtest of Borg's Student Opinion Survey.

(3) Students attending a nongraded high school will gain significantly more than students attending a graded high school when compared in critical thinking ability as measured by the Watson-Glaser Critical Thinking Appraisal.

REVIEW OF LITERATURE

Since the late decades of the last century, innovators seeking to better provide for individual differences of children have found it desirable to modify the graded structure which has existed since the Quincy Grammar School. Many of these modifications have currently fused into an organizational schema of nongradedness. Today hundreds of elementary schools have nongraded plans in operation (Goodlad and Anderson, 1963, p. 206) and three high schools are known to this writer to be nongraded and have "phased" their total curricula. These schools are Melbourne High School, Florida; Chippewa Valley High School, Michigan; and Western High School, Nevada. Other high schools in Florida, Texas, Illinois, Rhode Island, New York, California, Georgia, Hawaii, and Utah are currently in various stages of development toward the direction of nongradedness.

History of Graded Schools

The history of secondary education has been chronicled by DeYoung (1950, p. 191) into three rather distinct periods named after the institution characteristic of each era; (1) the Latin Grammar School, (2) the tuition academy, and (3) the free public high school. DeYoung reports that the first secondary school in America was the Boston Latin School which had it origin from a town meeting in Boston on April 23, 1635, where it was voted and recorded "that our brother, Philemon Pormount, shall be intreated to become scholemaster for the teaching and nourtering of children with us."

The Latin grammar schools were primarily restricted to the study of classical languages and literature and had an emphasis on theology. Guggenheim (1966, p. 181) and other writers do not recognize the appearance of graded schools until approximately 1845, but Butts and Cremin write of graded organization existing in the Latin grammar school by another name, "form."

> In a large school the boys were divided into classes or forms and progressed a form a year. The word 'form' originally meant a long bench without a back on it. The boys of a specific class sat on the bench and thus the word form came to be applied to a class or a grade in school. (1953, p. 123)

Gradually, according to DeYoung (1950, 1. 194), the leadership of these schools shifted from the clergy to the town and commercial executives and out of the new economic and social conditions in America arose the tuition academy in Philadelphia in 1751. The academies, which had a longevity of approximately 70 years, expanded the curriculum to include such fields as commerce and science and permitted young women to enter. (DeYoung, 1950, p. 195).

The third type of school and era was the free, public high school which was inaugurated with the establishment of the English Classical School in Boston in 1821. (DeYoung, 1950, p. 195) (Butts and Cremin, 1953, p. 262). The English Classical School was organized into three classes or grades until when in 1852 a four-year (grade) curriculum was introduced.

During the period between 1821 and 1860 the pressure of new subjects made arrangements desirable which would provide for "economy" of both the pupils' and teachers' time. The growth of population led to a greatly enlarged enrollment and a corresponding increase in the number of elementary and secondary schools, both of which remained, for the most part, without formal grades through this period; a few schools, such as the English Classical School in Boston, established grade designations. One of the early attempts at adopting a system of grading classes was made by J. D. Philbrick in 1848 in the Quincy Grammar School of Boston.

Guggenheim writes that within two decades after the establishment of the Quincy Grammar School Experiment, almost every elementary school in the country had adopted the graded system. He continues:

> The transition from ungraded class to a system of definitive grouping was accomplished in a remarkably short time. However, it must be recognized that this quick adoption was based more on administrative and organizational convenience than on sound psychological or pedagogical knowledge. (Guggenheim, 1966, p. 181)

The graded structure, which has existed since 1870 in both the elementary and secondary schools, has proven to be an orderly system of classifying the many students who flooded the American schools during the last 100 years; but to some educators, the pendulum had swung too far. One historian, William Shearer, interprets the change by stating that, "The pendulum had swung from no system to nothing but system." (Brown, 1963, p. 28) Indeed, by 1870 most schools were made up of graded classes, graded textbooks and content, and even graded teachers. The setting was right for the graded structure and so schools were graded and remained graded!" (Goodlad and Anderson, 1963, p. 56) This "all system" organization has eventually caused some educators to begin questioning the congruency of so much regimentation to individual differences of children.

Early Nongraded Efforts

Some educators questioned the graded organization during the nineteenth and early twentieth centuries and sought to modify the arbitrariness of grade standards rather than eliminate grades. Early experiment efforts to break away from the graded organization were initiated to the elementary schools but have undoubtedly affected the current movement away from grades in the high schools.

W. T. Harris is often credited with initiating the movement to modify the graded organization. In 1868 he introduced his St. Louis Plan of reclassifying students at six-week intervals. This plan maintained the graded organization but reduced its inflexiability. In the Pueb-lo Plan, 1888, all students studied all units of study but progressed at their individual rates in a "track" system. The Portland Maine Plan of 1910 permitted bright children to move through a nine-year plan at their own rate.

The Batavia Plan, 1910, New York, used additional teachers to aid slow learners while the North Denver Plan in 1910 gave the gifted a more individualized learning environment. Other similar plans included the Santa Barbara Concentric Plan in 1900 and the Platoon School of 1929 in Indiana. The Winnet'ka Plan of the 1920's divided the studies into individual and group activities and abolished grade promotion. The Dalton Plan, 1922 was designed to encourage children to move through academic areas at their individual rates. (Austin, 1957; Carbone, 1961; Goodlad and Anderson, 1963).

Recent Nongrading Efforts

More recent attempts toward nongradedness have been accompanied with research studies. An evaluation of the nongraded plan introduced at Western Springs, Illinois, in 1935 was completed by Wheat (1937, p. 175-183). He reviewed the scores on achievement test of children who had attended a nongraded primary plan and found them to be above the national norm.

A nongraded plan was begun in Milwaukee in 1942 is now the oldest nongraded system in operation. Milwaukee now has nongraded primaries in 116 of 117 elementary schools. Carbone's study (1961, p. 16) reports that a 1952 comparison was made of ninety-nine nongraded students with a control group of 123 graded students. It was found that reading achievement and personality adjustment were slightly better for nongraded students, even though the nongraded students were slightly lower on mental maturity.

During the 1955-56 school year the Appleton, Wisconsin Public Schools compared eleven fifth grade rooms with three nongraded intermediate groups of similar mental and chronological ages. The results favored the nongraded pupils in both reading and spelling. (Carbone, 1961, p. 16; Goodlad and Anderson, 1963, p. 57).

A comparison of achievement scores in the Mansfield, Ohio, Public Schools showed the average grade placement scores were .29 years higher following nongrading. "Apparently, the nongraded plan consisted of regrouping pupils in ungraded classes and comparing their achievement after one year under the new plan." (Carbone, 1961, p. 17).

Carbone also reported a comparison in Bellevue, Washington, of two graded classes with two nongraded classes. This comparison, which was made at the end of a three-year period, indicated the nongraded pupils showed greater achievement in reading.

The St. Louis Archdiocesan parochial schools compared the reading achievement scores of 5,169 pupils who had attended graded schools for three years with the scores of 8,281 pupils who had attended nongraded schools. The results indicated a significance at the .01 level of confidence for the nongraded students (Bockrath, 1958).

Vivien Ingram reports a study from Flint, Michigan, where sixty-eight nongraded students were compared to 337 students in the same school prior to initiating the nongraded plan. Results revealed a significantly higher mean score for the nongraded students in the language arts and reading tests (Ingram, 1960, p. 76-80).

Two elementary schools organized under the graded plan were compared with two nongraded schools in a study by Carbone in 1961. Both groups were composed of students in the fourth, fifth, or sixth year. The sampling procedure employed resulted in the selection of 122 nongraded students who were then matched for age and sex with 122 graded pupils. Analysis of covariance was used to compensate for the difference in the mean intelligence quotient of the two groups. The results indicated the graded students scored significantly higher (p. 91) in one of the five mental health factors and in all six areas of achievement.

Buffe (1962) matched one-hundred and seventeen students from a nongraded school with the same number from a graded school in a different community. He found the nongraded children to have made the greater gains in the two areas of achievement and mental health.

In Hillson's study (1964) one group of children was assigned to experimental nongraded classes, while others composed the control groups. The performance of the nongraded students was signficantly higher than the control group on reading, word-meaning, and paragraph meaning at the end of three years.

Two groups of 146 students each, one nongraded and one graded, was studied by Halliwell (1963). The nongraded group scored slightly higher, but the differences were not statistically significant except in third grade spelling.

Gilbert found that in Chicago's Tesla School only nine per cent of the students required a period of four years in the primary classes under the nongraded plan as compared to thirty per cent before the nongraded plan went into effect. Telsa School, which enrolls mostly disadvantaged youth, raised its ranking from eleventh in 1960 to fifth in its district in 1963 in the number of children reading at or above the expected level for their mental age (NEA, Research Memo, 1965, p. 6). Thus, from this and other studies of nongraded elementary schools, one is obliged to acknowledge the achievement gains associated with the nongraded organization.

The review of the literature revealed that researchers have chosen the dependent variable of student-achievement as the primary gauge for measuring success in nongrading. Surely innovators would prefer their programs be also judged by additional criteria such as student-attitude and critical thinking ability. But studies designed to statistically evaluate the attitudes and critical thinking ability of students attending a nongraded school are almost non-existant. It is felt by this researcher that these factors are equally as important in the evaluation of an innovation. Cronbach (1954, p. 325) states, "The attitudes of subject often must be considered in the research design because this variable can have a significant effect upon the subject's performance on other measures." He also believes that attitudes are one of the most enduring and useful learning in that they are most likely transferred to new situations and receive confirmation which refreshes the knowledge. "These sort of learning endure and according to some studies, grow even further after instruction has ended." (Cronbach, 1964, p. 403)

The importance of attitudes as related to achievement is stressed by both Travers (1963, p. 293) and Pintner (1956). Travers speaks of the acquisition of information as not being the only goal of education; certain ideas and habits or attitudes of mind are equally, if not more, important.

> Some writers suggest that attitudes are primary in importance. Unless we have the right attitude toward what we are doing, our performance will probably not represent our best. It is apt to be a half-hearted affair. (Pintner, 1956, p. 155)

The volume of research in critical thinking is not commensurated with the frequency of use of the term in statement of educational objectives and pedagogical writings. The importance of this skill is stressed by Russell when he states:

> In a world of conversation, admonition, newspapers, books, and television programs, the child needs to develop the ability to evaluate ideas, to be critical in scientific, social, and personal matters. This seems to involve attitude plus knowledge of facts plus some thinking skills. (Harris, 1960, p. 651)

Johnson, in the 1960 Encyclopedia of Educational Research (Harris, 1960, p. 652) reports that in a college sample the Watson-Glaser Critical-Thinking Appraisal correlated only .41 with general intelligence and .38 with reading ability, and so seems to be a measure of some other ability.

Several experimental studies by Anderson, Heber, Thelen and others have demonstrated that critical thinking can at least be improved as a result of training directed to this end. (Harris, 1960, p. 652; Watson and Glaser, 1964, p. 12). Herber's 1959 doctoral study found that variables such as grade level and course do affect the development of critical thinking. It therefore seems reasonable to assume that the removal of all grade levels in a nongraded school may affect the critical-thinking ability of the students.

Survey of School Systems Using Nongrading

Though there is no conclusive data favoring the nongraded organization over the graded, the preponderance of studies appears to favor nongrading in the lower school years. These favorable results are apparently spurring the employment of nongraded practices as revealed by a 1964 National Education Association Survey. In May 1964, the NEA Research Service made a postal card survey to determine how many urban school systems had nongraded or partially nongraded elementary or secondary schools. Questionnaire cards were sent to 441 school systems of 12,000 students or more. Replies were received from 353 or eighty per cent. Nearly a third of the school systems reported having one or more elementary schools with a nongraded "sequence." Only 12 systems, or 3.4 per cent had or planned to have some nongrading in the secondary school. (NEA Research Mem, 1965, p. 2). It should be noted in reading the above percentage that they were based on the number of school systems sampled and not the total percentage of schools.

Coerviceness for Vertical Reorganization

The trend toward vertical reorganization or nongrading in the elementary schools has progressively increased the number of articles and research relating to nongradedness, but little can be found specifically relating to the nongraded high school. The principal, and practically the sole contributor to literature on the nongraded high school, is B. Frank

Brown, principal of Melbourne High School, Florida. But the writings of several influential educators and psychologists are advocating a vertical and horizontal organizational structure in our high schools that are more congruent with the principle of individualized learning.

Dr. Oestreich (1963, p. 5) of Indiana University, believes that the primary step toward individualized education is to stop putting "new chrome on an old bus." He then adds, "I am going to suggest, therefore, that we begin to deal more vigorously with the organizational of our schools because, it seems to me, that unless we do, we shall only be adding new gadgets to our already antiquated educational bus."

Cronbach and other psychologists have recognized for many years that the present graded organization is not comparable with child development. Cronbach reiterates this by saying:

> Rigid-age-grading is not a good policy for a school . . . it is not correct to assume that people go through the developmental sequence at any exactly uniform rate or in a fixed order. They do not. (Cronbach, 1954, p. 224)

Pintner warns against too much organization by reminding school administrators that their pursuit for effeciency and economy is not the goal of education.

> In the search for economy and efficiency in education care must be taken, however, to remember that people differ. The same methods and materials cannot be used in the same way for everybody. (Pintner, 1956, p. 155)

The views of Cronbach and Pintner are linked more closely to school reorganization by Guggenheim (1966, p. 4), when he calls educators' attention to the fact that schools today are witnessing the influx of unprecedented number of students from all socio-economic classes.

> The growth of a diversified school population has increased the requirements of the educational task. No longer can we expect school created to meet the needs of a rather homogeneous middle class to be able to educate students with different backgrounds and educational needs with the same materials and methods of teaching utilized heretofore. (Guggenheim, 1966, p. 4)

Other writers view our educational practices as being almost criminal at our present stage of sophistication of insight on child growth and development. Hillson (Guggenheim, 1966, p. 206-207) makes it clear that nongrading cannot eliminate these "criminal" practices, "But let me further indicate that any plan that attempts to do it must essentially be basically without regard for what we term 'grades' or 'grade levels'." These sentiments were also expressed by Jerome Bruner when he said, "School grading is simply a poor piece of technology for using the resources of the school, one that has to be removed if the next step is to be take." (Brown, 1965, p. xii)

Frank Brown, who is the most active and ardent advocate in advancing nongrading in secondary schools, would undoubtedly agree with Hillson and Bruner. Brown, who has written two books and numerous articles on the nongraded high school, perceives the grade as strictly an administrative device. "It serves as a comfortable compartment in which school administrators can, and do, catalog youngsters for custodial purposes." (Brown, 1963, p. 44)

Primal Nongraded High School

Melbourne High School, which was reorganized by Dr. Brown and his faculty in 1958, is serving as a model for the experimental school of this study and for most of the other nongraded secondary schools. Students in nongraded high schools, such as Melbourne, do not go through the academic program as sophomores, juniors, and seniors. Instead, students are allowed to select their own program based upon their standardized test scores, past achievement, and interests. Each subject has one to five achievement levels or phases in which the student places himself. Phase I of a course is remedial in nature, whereas Phase V is for the exceptionally high achievers of a subject. Thus, a student may be Phase IV in art, Phase I in English, and Phase II in social studies.

Since the initiation of this study, a comparative study was made of sixty-two Melbourne High School seniors to determine whether the sample of Melbourne High School seniors differ significantly from a matched sample of seniors from another school. Sixty-two seniors from each of the two schools were matched by socio-economic status, sex, and intellectual capability.

The Melbourne seniors outperformed their matched pairs at the 0.05 level of significance in English and mathematics and at the 0.10 level in science and on attitudes of students toward their school. In addition, the middle range (level 2) of seniors from Melbourne outperformed their matched pairs on the critical thinking appraisal at the 0.05 level of significance. (Besvinich and Crittenden, 1966) A critical evaluation of the study revealed that the grouping organization used in the "SPACE" program of the phased grouping at Melbourne.

PROCEDURES AND HYPOTHESES

In order to test the hypotheses of the study, a control-group experimental design was employed with groups being established by random assignment. The techniques of this design as summarized by Borg (1963, p. 304) include the following basic steps: (1) select the random samples of the two schools; (2) administer the pre-tests which are designed to evaluate the dependent variables; (3) expose the control and experimental groups to the independent variables; (4) administer the post tests; and (5) compare the final means to determine if differences are statistically significant.

The Sample

Selection

Samples were selected from two high schools in Clark County, Nevada. The graded high school of this study was selected because it has remained the most traditional of the five public high schools located in the same city as the nongraded high school. The random samples of the two schools were selected from a population of 470 tenth year students at the graded high school and 445 tenth year students at the nongraded school. Two hundred and thirty sample members were initially selected from each school's rosters. The extra students were included to compensate for the loss of sample members which would occur due to absentees, transfers, and the elimination of members due to some not having available an intelligence quotient score. The final number of sample members participating in both the pre and post testing numbered 141 for the graded school and 141 for the nongraded school.

The samples were stratified in order to assure that the proportion of boys to girls would be representative of the population and to assure the researcher of adequate cases for sub-group analysis. Sample members were also placed into one of three ability groups according to their intelligence quotient score derived from the California Test of Mental Maturity. The I. Q. ranges selected for these groups were: Low = 99-down, Average = 100-119, and High = 120-up. Names of the ability levels such as "average" were not meant to be synonymous wit the more popular definition used in other studies and reports. The distribution of each school's members into these groups is given below in Table 1.

The only comparison group which was significantly different (.05 level) in mean I. Q. was the low-ability boys. In this case the I. Q. mean of the nongraded boys was significantly higher than the I. Q. mean of the graded boys. Considering the fact that the I. Q. scores of the groups were not identical it is possible that more significant comparisons would have been revealed if an analysis of covariance program could have been used to adjust for I. Q. and pre-test differences. The I. Q. data for all groups are given in Table 2 on the next page. The number (N) listed for each group was constant for each variable discussed in this study.

Table 1. Distribution of sample members into three ability groups

		Low	Average	High	Total
Graded High School	Boys	11	26	28	65
	Girls	16	43	17	76
	Total	27	69	45	141
Nongraded High School	Boys	7	39	23	69
	Girls	19	38	15	72
	Total	26	77	48	141

Table 2. Comparison of I. Q. 's

Groups	N	I. Q. Mean	S. D.	Difference	t
G, low, boys	11	88.09	5.62	5.62	2.19*
NG, low, boys	7	93.71	5.09		
G, av., boys	26	109.69	6.01	.46	.31
NG, av., boys	39	110.15	5.66		
G, high, boys	28	126.71	5.87		
NG, high, boys	23	126.83	4.95	.12	.08
G, low, girls	16	88.00	9.23	4.68	1.8
NG, low, girls	19	92.68	4.97		
G, av., girls	43	108.49	5.97	1.27	.94
NG, av., girls	38	109.76	6.16		
G, high, girls	17	126.65	4.29	2.38	1.8
NG, high, girls	15	124.27	2.79		

*Significant at the .05 level.

The Schools' Community

The school community of the two samples is Las Vegas, the county seat of Clark County, Nevada. A desert community, it is noted for an array of luxurious resort-hotels and casinos which flourish under state-legalized gambling and serve as the major industry of the city. Other stimulants to the economy include Nellis Air Force Base and the Atomic Energy Commission test site. The population, less than 10,000 before World War II, was 64,405 in 1960 and was estimated to be 110,000 in 1966.

The school system of Las Vegas and Clark County has experienced a proportional growth with the total population in that sixteen new schools have been opened in the past two-years. There are presently 60,000 students enrolled in kindergarten through the twelfth year. The minimum teachers' salary for 1965-66 was $5,301, the maximum was $10, 602, and the average was $7,150. The state's public school expenditure during 1965-66 was $505 per child. Many of the newer approaches to teaching and learning are in the various public high schools serving Las Vegas and Clark County. These include: cooperative teaching, team teaching, modern math, educational television, flexible scheduling, nongraded schools, and many other curricular extensions. Thus, it can be said that both schools are located in a district noted for innovative endeavors.

The student population of the school district is transient in nature due to the rapid growth of the county, fluctation in the number of construction worker families resulting from the economic instability existing in the community during the last three years, and the transient nature of test site workers' families brought about by national defense, national economy, and union strikes. An Evaluative Criteria study at the nongraded school during the 1965-66 school year showed that twenty-five per cent of the 1965-66 graduating class had attended the school less than two full years.

The schools

The graded school. The graded school, which will also be referred to in the study as the comparison school, has a student enrollment of approximately 1,300. The school, which opened in 1930, is the oldest secondary school in the city. Facilities have been re-allocated to provide areas suitable for large groups and three seminar rooms that have given greater instructional flexibility. The school library provides eleven volumes per student and is furnished primarily with large tables and one four-place wrap-around carrel. The school is administered by a principal, two assistant principals, attendance officer and dean of boys, dean of girls, banker, and registrar. There are four counselors for the student body.

Table 3 reveals that 52 per cent of the 65 teachers, of which forty-five are men and twenty are women, have a master's degree or above. Seventy-nine per cent have thirty-two semester hours or more above the bachelors degree. Seventy-one per cent have seven or more years of teaching experience. These and other teacher data of both the graded and non-graded schools are given in Table 3.

Table 3. Teachers' ages, training and teaching experience

	Graded school	Nongraded school
Number of teachers:	65	73
Men	45	45
Women	20	28
Age	Per cent	Per cent
20-29	17	24
30-39	19	51
40-49	35	15
50-59	23	7
Above 59	6	3
Training		
Bachelor	12	18
Bachelor + 16 semester hours	9	18
Bachelor + 32 semester hours	27	21
Master	34	30
Master + 16 semester hours	4	3
Master + 32 semester hours	14	9
Doctorate	0	1
Training experience		
1 to 6 years	29	34
7 to 12 years	22	52
13 to 18 years	29	8
Above 18 years	20	6

During the last sixteen month period from October 1965, through January 1967, there have been three in-service training sessions held specifically for the staff members of this school: a three-hour session on the subject of creativity in which 100 per cent of the staff was involved, a three-hour English session involving ten per cent of the staff, and a one-hour audio-visual session involving fifty per cent of the staff. At the present, twenty-one are involved in developing course guides in the areas of English, mathematics, and science.

The percentage of attendance for the first four full months of the 1966-67 school year was ninety-one and one-tenth per cent for October, eighty-nine and nine-tenths per cent for November, ninety and one-tenth per cent for December, and eighty-nine and one-tenth per cent for January. The school administration describes the student body as being composed of two distinct socio-economic groups. The lower group comes from apartment housing and the higher from the older, more established homes of the city.

Many of the latest materials and practices are used in the graded school. Six courses are team taught. The number and types of audio-visual aids have been greatly expanded during the present year. Many of the new curricular materials such as BSCS, CHEM, PSCS, remedial reading materials, and programmed American history and government are being used. The administration has contracted to have fifty-seven study carrels constructed to supplement the independent study program. Presently there are approximately forty students who have either contracted a study for credit or are researching a subject in depth in addition to their regularly scheduled course assignments.

The school's vertical organization is divided into three grade levels: sophomore, junior, and senior. With the exception of a few, courses are designated and reserved for students of specific grades. The horizontal organization of the school provided for the various achievement rates of students by offering courses of various achievement depths. Students were enrolled in eighty-nine different courses and levels during the second semester of 1966-67. Most all courses were offered in blocks of two semesters. Students are normally not allowed to change courses after two weeks of the first semester.

The nongraded school. The nongraded school, which will also be referred to in the study as experimental school, has a student enrollment of approximately 1670. This school, which opened in 1961, was constructed with a design functionally comparable to schools built three decades earlier. Since opening, the floor space has been re-allocated to provide seven spaces capable of housing forty-five or more students for larger group instruction. The number of seminar rooms has been expanded to thirteen. Most of the library tables have been converted into 100 wrap-around study carrels. Books in the library number 13,000, a book-student ratio of seven and eight-tenths volumes per student. The school is administered by the principal, three assistant principals, dean of students, dean of activities, and a director of research. There are five counselors for the student body.

Forty-three per cent of the seventy-three teachers, of which forty-five are men and twenty-eight are women, have a master's degree or above. Sixty-four per cent have 32 semester hours or more above the bachelor's degree. Sixty-six per cent have seven or more years of teaching experience. Table 3 on page 27 provides additional teacher data.

During the 1965-66 school year, forty-two per cent of the teachers participated in an in-service course, "Nongraded Secondary School," sponsored by the district. This course had emphasis on structuring a non-graded curriculum and developing continuous progress guides for various courses. Presently there are thirty-five teachers using continuous progress guides and techniques, to various degrees, in at least one class which they teach.

Attendance records reveal the following attendance percentages: October, 95.9; November, 95.7; December, 95.2; and January, 94.5. Students attending the nongraded school live in homes and apartments which have been built since the early development of the immediate school community in 1958. The families occupying these dwellings are largely supported by fathers who are employed at the atomic energy test site north of the city. Occupations of the fathers vary from construction workers to technical-professional personnel.

Like the graded comparison school of this study, the nongraded school employs many of the latest pedagogical materials and practices. Large-group instruction primarily involves cooperative teaching situations composed of two teachers. The science department makes wide use of currently produced curricular materials. Several teachers are developing their own array of materials in their attempt to provide a program of continuous progress. The administration estimates that approximately ten per cent of the student body is involved in independent research. Those students who have contracted to research a topic for credit are privileged to move about in the areas where their study carrels, resources, and research director are located.

The school's vertical organization of nongradedness is without subject-matter grade levels. The total curriculum is open to all members of the student body regardless of years spent in school, thus allowing students to make course selections according to their felt needs and interests. In addition to offering all courses to all students, most courses are phased in an attempt to provide students a choice of achievement levels. Thus, a student may be in a high achievement phase in literature and be in a low achievement phase in government.

It should be mentioned that in a personal communique from Dr. John Goodlad that he implied that an evaluative study designed to evaluate the effectiveness of vertical-reorganization (nongrading) will not be "pure" if horizontal changes such as phasing accompany the vertical reorganization. If phasing is recognized as being only horizontal and not vertical in nature, this study becomes one of a comparative evaluation of a nongraded high school with horizontal re-structuring by phasing.

During the second semester of 1966-67, the students of the nongraded school were enrolled in 129 different courses or phases of the same course. In addition to these 129 there were thirty different unphased courses which are not designed for a specific achievement level. The number of the different phases composing the 129 different sections is shown below. It should be pointed out that even though the curriculum was designed to provide only the distinct phases of I, II, III, IV, and V, it was necessary to combine some phases because of the small enrollment in some classes. These classes are designated by I-II, II-III, III-IV, and IV-V.

Phase	I	I-II	II	II-III	III	III-IV	IV	IV-V	V
Number of different courses or phases	5	4	20	3	25	19	25	18	10

Courses are offered on a semester basis in an attempt to provide greater flexibility in compensating for students' changing interests and subject matter needs. To move from one phase or course to another, students must submit a request for program change form to the involved teachers and if approved may move at five-week intervals. Readers who are interested in a more detailed description of this program should turn to the appendix of this study and refer to "Questions and Answers about Nongrading and Related Concepts."

Data Gathering Instruments

Data for analysis of the results of the treatment were collected by means of two commercial standardized tests and one non-commercial test, which was developed for the Western States Small Schools Project. This non-commercial test, which was developed by Walter Borg, is titled Student Opinion Survey. The two commercial tests used were the California Achievement Test, (CAT), Form X, and the Watson-Glaser Critical Thinking Appraisal, Form Y_m. The independent variable of graded-nongraded was in effect approximately seven months between the pre-testing on October 5 and 6, 1966, and post-testing on April 26 and 27, 1967. In addition to the administering of the three tests during the pre-testing session, the California Short-term Test of Mental Maturity (I. Q.) was given.

Student Opinion Survey

The Student Opinion Survey is a Lickert type attitude scale which was originally desigend to measure four aspects of the pupil's attitude towards high school (Borg, 1962, p. 1). The fourth subscale, "Attitude Towards Small Versus Large Secondary Schools" was not applicable to this study and was, therefore, deleted.

Attitude areas. The three attitude areas measured in this study include:

(1) Subscale A. "Attitude Towards Teachers." The seventeen items of this subscale aim at measuring those aspects of the student's over-all attitude towards the school situation which relates specifically to his teachers.

(2) Subscale B, "Attitudes Towards the School's Educational Program." The twenty items of this subscale are concerned with the specific educational program and curriculum of the school and contain items related to the importance of course offerings. Some items reflect the general perception of the student concerning the over-all effectiveness of the school and its program.

(3) Subscale C, "Educational Value." The eighteen items composing this section reflect the student's attitude toward the importance of education. It indicates the degree to which he values education as a means of attaining his future goals (Borg, 1962, pp. 1-2).

The three subscales were used to determine which areas of students' attitudes are most markedly affected by the independent variable and if the attitudes differ significantly between the students of the graded school and students of the nongraded school.

Scoring. Each item of this Lickert type instrument applies to the score on one subscale only. The student's answer is weighted from one through five. A high score always indicates a favorable attitude so that answer "a" (strongly agree) is weighted "5" for a positive or favorable item and is weighted "1" for an unfavorable or negative item. Conversely, answer "e" is weighted "1" for a positive item and "5" for a negative item (Borg, 1962, p. 8).

Reliability. Borg (1962, p. 10) using the split-half correlation technique found the reliability for the total scale to be .99, corrected using the Spearman-Brown Prophesy Formula. Borg found the reliability for the three subscales to be: (1) .99 for "Attitude Toward Teacher," (2) .86 for "Attitude Towards the School's Educational Program," and (3) .82 for "Educational Value." The Kuder-Richardson formula was used in this study to determine the reliability of both the pre and post-tests. The reliabilities for the three subscales were found to be: (1) .18 and .35 for "Attitude Towards Teachers," (2) .45 and .50 for "Attitudes Towards the School's Educational Program," and (3) .70 and .71 for "Educational Value." The pre- and post-test reliabilities for the three subscales combined were .72 and .75.

California Achievement Test

The California Achievement Tests, (CAT) are perennially administered to all tenth year students of the Clark County School District during early October; this factor was the primary reason for employing this instrument. The battery is composed of three tests: Reading, Mathematics, and Language. These three tests are further divided into two parts each. Because of the desire to maintain optimum relationship with the two schools, it was decided to reduce the total testing time by administering three, instead of six, of the sub-tests. This decision reduced the testing time of the total project by one hour. The sub-tests administered were Reading Comprehension, Mathematics Reasoning, and Mechanics of English.

Subtests. The Reading Comprehension test is designed to reveal the student's comprehension of what he reads, such as comprehending factual information, making proper inferences, and drawing valid conclusions from materials read. The object of the Mathematic Reasoning test (Tiegs and Clark, 1957, p. 7) is to provide mathematic items which will quickly reveal the degree of functional ability rather than to include long and involved problems in the solution of which differences in attention span may operate as an additional variable. The three sections of the Mechanics of English test - Capitalization, Punctuation, and Word Usage - sample twenty-four different elements of the mechanics of English. (Tiegs and Clark, 1957, p. 5-6).

Reliability. The coefficient of reliability of the CAT subtests as reported by the test devisors was computed using the Kuder-Richardson formula. The data used for the compilations were derived from a single grade range, grade 11. A reliability coefficient of .91 was obtained for the Reading Comprehension test, .89 for the Mathematic Reasoning test, and .94 for the Mechanics of English test. (Buros, 1965, p. 17; Tiegs and Clark, 1963, p. 8) The Kuder-Richardson formula was used in this study to determine the reliabilities of both the pre-and post-test of the CAT subtests. The "pre" and "post" reliabilities of the subtests were found to be: (1) .87 and .73 for the Reading Comprehension test, (2) .85 and .88 for the Mathematic Reasoning test, and (3) .90 and .90 on the Mechanics of English Test.

Watson-Glaser Critical Thinking Appraisal

The Watson-Glaser Critical Thinking Appraisal was designed to measure the extent to which examines have mastered certain critical thinking skills and thus provides a partial estimate of the extent to which this trait has been achieved. The five subtests of the test are designed to measure the following aspects of critical thinking: inference, recognition of assumptions, deduction, interpretation, and the evaluation of arguments. The test authors, Watson and Glaser (1964, p. 9), do not encourage efforts to utilize the part-scores on the test to evaluate individual attainment in the five sub-skills since the part-scores are based upon a relatively small number of items and therefore lack sufficient reliability for this purpose.

Reliability. The odd-even split-half reliability coefficient, corrected by the Spearman-Brown formula, was determined to be .86 through the testing of 2,947 tenth year students (Watson-Glaser, 1964, p. 14). The reliability of the instrument in this study, using the Kuder-Richardson formula, was found to be .99 for the pre-test and .76 for the post-test.

California Short-Form Test of Mental Maturity

Level 4 of the California Short-Form Test of Mental Maturity was administered during the pre-testing session to provide the intelligence quotient of students attending the two schools. This well-known instrument consists of seven test units, each being a different mental exercise designed to measure the student's functional capacities (Sullivan et al., 1963; Boros, 1965, p. 696). The intelligence quotient derived from the scores of this test served as a means of classifying students into the three ability groups. In addition, the I.Q.'s derived from these tests for the two schools were compared to determine whether the two samples differed significantly as to this variable.

Testing Periods

During both the pre-testing in October and the post-testing in April, every effort was made to duplicate the testing conditions of the two schools. Testing days selected for the schools were ones considered routine and back-to-back. The same tests were administered to the students of the two schools during the same time of day and under standardized conditions. The post-tests were administered as close to the closing of school as possible without being affected by the numerous activities that accompany the closing of large high schools. In order to lessen the possibility of a Hawthorne effect, students and teachers were not informed that the test results would be used in comparing their school with another.

Treatment of Data

The analysis of variance was employed to determine whether there were significant gains between the group means of the graded and non-graded schools on measures of achievement, attitude, and critical thinking. The usefulness of the analysis of variance technique is discussed by Johnson.

> The modern advances in experimental and sampling designs have become possible through the development of exact tests of significance and of the analysis of variance. Without these tools, the assessment of the components of

> variation traceable to the sources specified by the experimental or sampling design would be very involved and difficult enterprise. (Johnson, 1949, p. 210)

Garrett's latest edition in 1965 continues to stress the worth of the techniques by saying, "The value of analysis of variance in testing experimental hypotheses is most strikingly demonstrated in those problems in which the significance of the differences among several means is desired." (Garrett, 1958, p. 279) Pairs of mean differences found in this study, through the use of analysis of variance, were tested for significance by using the t test. The use of this test is presented in more detail in the next section of this study.

It would be well to review the fact that the sample members of each school were stratified by sex. The design resulting from this stratification is illustrated by the model in Figure 1. The tenth year boys in each school (block) are represented by the shaded area and the girls are represented by the clear area. After the stratification by sex the boys and girls of both schools were than placed into one of three ability levels according to their intelligent quotient score derived from the CTMM. The various comparisons groups which resulted may be more easily grasped by referring to the model in Figure 2. In analyzing the model one notices that six different groups or conditions were formed in each school. These groups, which are listed below, were used for comparing the students on each of the seven variables (tests).

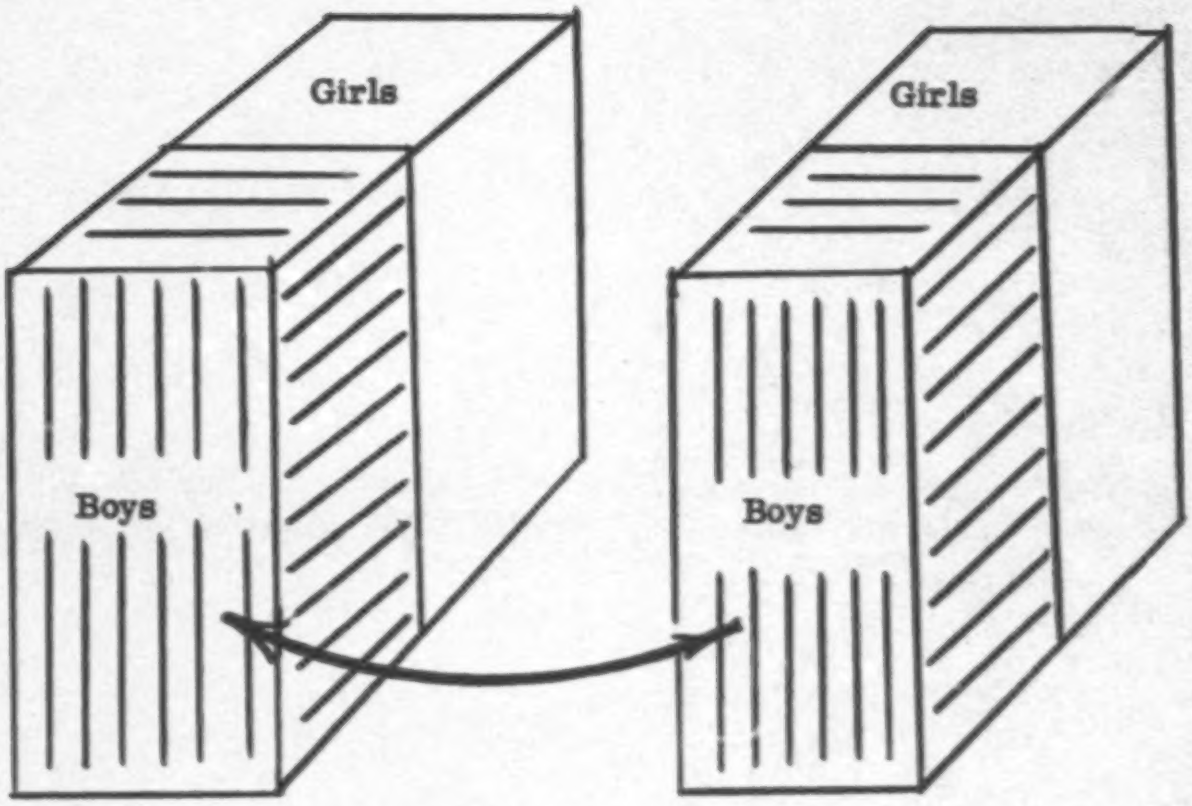
Girls
Boys
Girls
Boys

Figure 1. Stratification of the two schools by sex

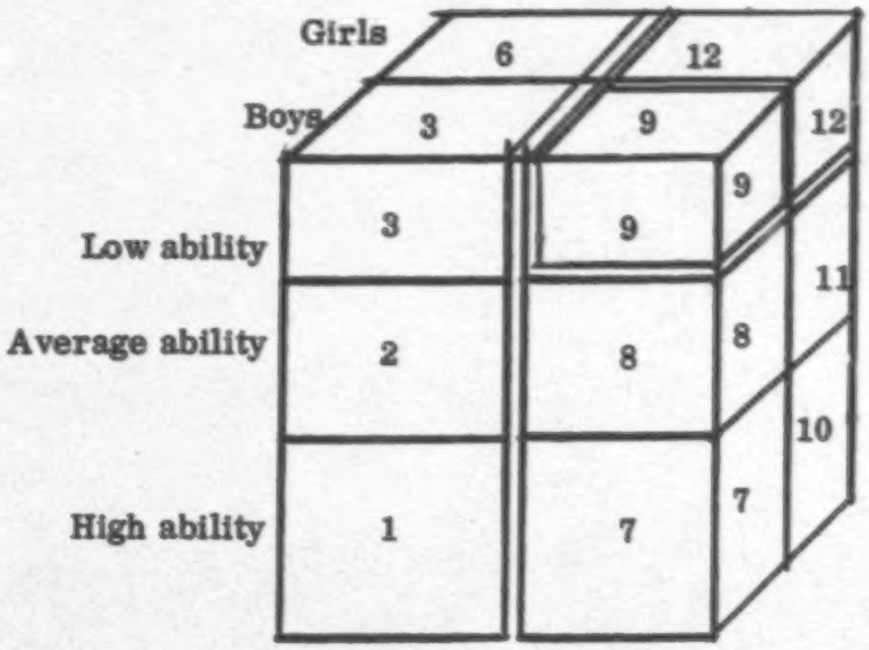
Girls
6
12
Boys
3
9
12
9
3
9
11
Low ability
Average ability
2
8
8
10
High ability
1
7
7

Figure 2. The comparison groups formed from the three variables of school, sex, and ability level

Graded School

1. Graded school, High ability, Boys
2. Graded school, Average ability, Boys
3. Graded school, Low ability, Boys
4. Graded school, High ability, Girls
5. Graded school, Average ability, Girls
6. Graded school, Low ability, Girls

Nongraded School

7. Nongraded school, High ability, Boys
8. Nongraded school, Average ability, Boys
9. Nongraded school, Low ability, Boys
10. Nongraded school, High ability, Girls
11. Nongraded school, Average ability, Girls
12. Nongraded school, Low ability Girls

The same type groups of the two schools were compared on each of the seven dependent variables for significant differences in gain. For example, Group 3 and Group 9 of the two difference schools are of like types and were therefore compared on each of the seven variables; Reading Comprehension, Mathematic Reasoning, Mechanics of English, Attitude Towards Teachers, Attitudes Towards the School's Educational Program, Educational Value, and Critical Thinking. The like groups of the two schools are graphically presented in Figure 3. In addition to comparing like groups on each of the seven variables, a total comparison was made between the two schools on each variable.

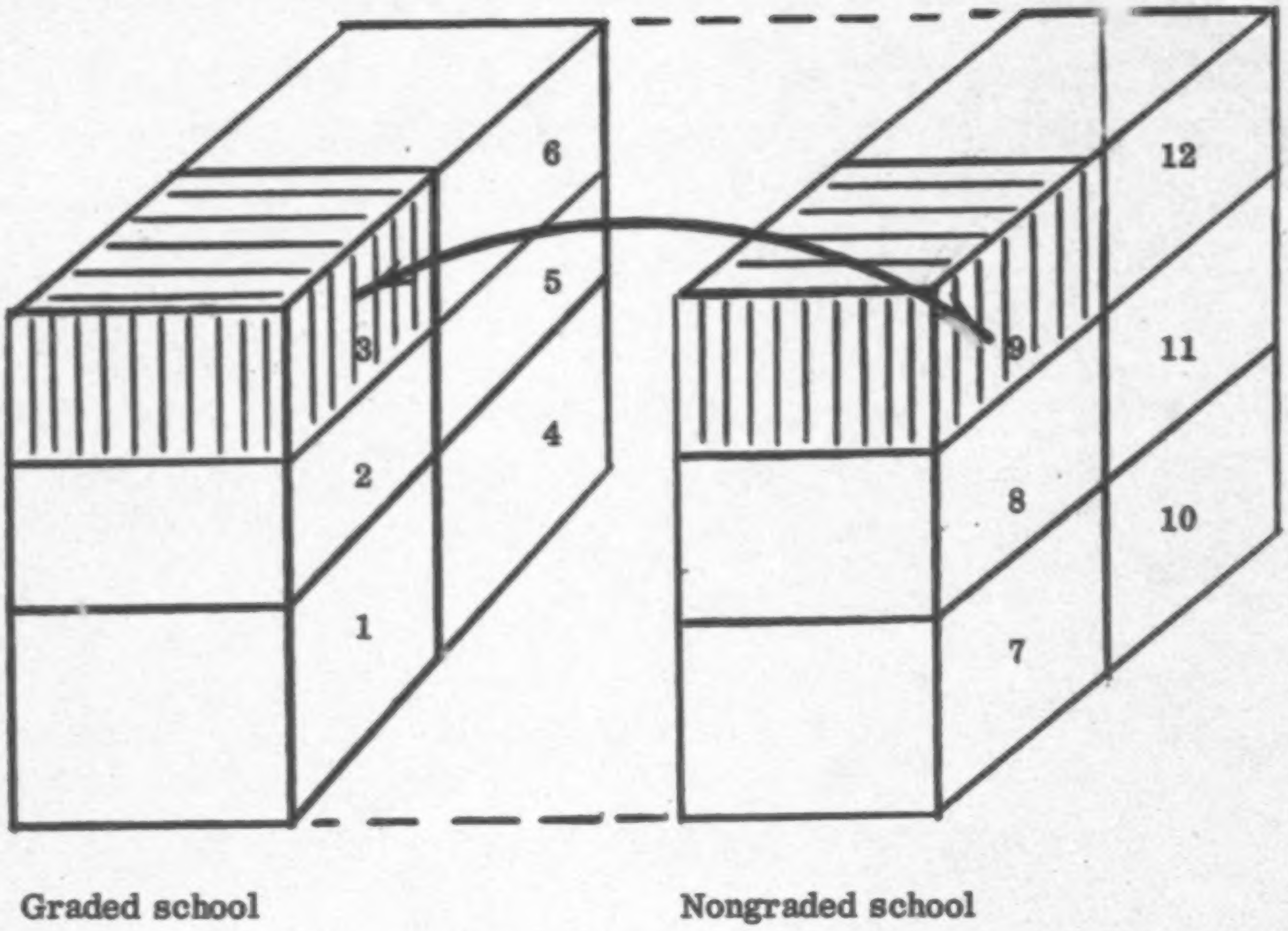
6
5
3
4
2
1
12
11
9
10
8
7
Graded school
Nongraded school

Figure 3. Comparison of like groups of the two different schools

In addition to determining the simple effects of the schools by the comparison of like-groups it seemed desirable to determine if interaction effects existed between the schools and sex, and the schools and ability levels. Ostle defines interaction effect as:

> Interaction is the differential response to one factor in combination with varying levels of a second factor applied simultaneously; that is, the two factors combine to produce an added effect not due to one of them alone. (Ostle, 1954, p. 345)

A significant interaction is one that is too large to be explained on the basis of chance.

> With a significant interaction, the factors are not independent of one another; the simple effect of a factor differ and the magnitude of any simple effect depends upon the level of the other factor of interaction term. (Steele and Torrie, 1960, pp. 198-199)
>
> If the interaction is nonsignificant, it is concluded that the factors under consideration act independently of each other; the simple effects of a factor are the same for all levels of the other factors, . . . (Steele and Torries, 1960, pp. 198-199)

The data was tested for interaction effect by assuming that there were no significant interaction effects between school and sex and school and ability level; that is, the hypothesis of no interaction was employed. The specific interaction hypotheses which were tested are stated in the following section of this chapter.

Hypotheses

Even though there were only three research hypotheses stated earlier, the reader has undoubtedly realized that the experimental design discussed in these pages would produce many comparisons, each which could and is stated as a separate hypothesis. Because of the review of literature favored nongradedness, each of the three general hypothesis was stated in favor of the nongraded high school. But in order to facilitate the statistical analysis and presentation of the data, each statistical hypothesis was stated as a null hypothesis. In addition, a hypothesis of no interaction was used in determining if interaction effects existed between the school and sex and the school and ability level. The following null hypotheses were tested.

Achievement hypotheses

Reading comprehension. 1. There is no significant difference in the reading comprehension (CAT) when comparing high-ability boys attending a nongraded high school with high-ability boys attending a graded high school.

2. There is no significant difference in the gain in reading comprehension (CAT) when comparing average-ability boys attending a nongraded high school with average-ability boys attending a graded high school.

3. There is no signficant difference in the gain in reading comprehension (CAT) when comparing low-ability boys attending a nongraded high school with low-ability boys attending a graded high school.

4. There is no significant difference in the gain in reading comprehension (CAT) when comparing high-ability girls attending a nongraded high school with high-ability girls attending a graded high school.

5. There is no significant difference in the gain in reading comprehension (CAT) when comparing average-ability girls attending a

nongraded high school with average-ability girls attending a graded high school.

6. There is no significant difference in the gain in reading comprehension (CAT) when comparing low-ability girls attending a nongraded high school with low-ability girls attending a graded high school.

7. There is no significant difference in the gain in reading comprehension (CAT) when making a total school comparison of students attending a nongraded high school with students attending a graded high school.

Mathematic reasoning. 8. There is no significant difference in the gain in mathematic reasoning (CAT) when comparing high-ability boys attending a nongraded high school with high-ability boys attending a graded high school.

9. There is no significant difference in the gain in mathematic reasoning (CAT) when comparing average-ability boys attending a nongraded high school with average-ability boys attending a graded high school.

10. There is no significant difference in the gain in mathematic reasoning (CAT) when comparing low-ability boys attending a nongraded high school with low-ability boys attending a graded high school.

11. There is no significant difference in the gain in mathematic reasoning (CAT) when comparing high-ability girls attending a nongraded high school with high-ability girls attending a graded high school.

12. There is no significant difference in the gain in mathematic reasoning (CAT) when comparing average-ability girls attending a nongraded high school with average-ability girls attending a graded high school.

13. There is no significant difference in the gain in mathematic reasoning (CAT) when comparing low-ability girls attending a nongraded high school with low-ability girls attending a graded high school.

14. There is no significant difference in the gain in mathematic reasoning (CAT) when making a total school comparison of students attending a nongraded high school with students attending a graded high school.

Mechanics of English. 15. There is no significant difference in the gain in mechanics of English (CAT) when comparing high-ability boys attending a nongraded high school with high-ability boys attending a graded high school.

16. There is no significant difference in the gain in mechanics of English (CAT) when comparing average-ability boys attending a nongraded high school with average-ability boys attending a graded high school.

17. There is no significant difference in the gain in mechanics of English (CAT) when comparing low-ability boys attending a nongraded high school with low-ability boys attending a graded high school.

18. There is no significant difference in the gain in mechanics of English (CAT) when comparing high-ability girls attending a nongraded high school with high-ability girls attending a graded high school.

19. There is no significant difference in the gain in mechanics of English (CAT) when comparing average-ability girls attending a nongraded high school with average-ability girls attending a graded high school.

20. There is no significant difference in the gain in mechanics of English (CAT) when comparing low-ability girls attending a nongraded high school with low-ability girls attending a graded high school.

Attitudes hypotheses

Attitude toward teachers. 22. There is no significant difference in the gain in attitude towards teachers (SOS) when comparing high-ability boys attending a nongraded high school with high-ability boys attending a graded high school.

23. There is no significant difference in the gain in attitude towards teachers (SOS) when comparing average-ability boys attending a nongraded high school with average-ability boys attending a graded high school.

24. There is no significant difference in the gain in attitude towards teachers (SOS) when comparing high-ability girls attending a nongraded high school with high-ability girls attending a graded high school.

25. There is no significant difference in the gain in attitude towards teachers (SOS) when comparing high-ability girls attending a nongraded high school with high-ability girls attending a graded high school.

26. There is no significant difference in the gain in attitude towards teachers (SOS) when comparing average-ability girls attending a nongraded high school with average-ability girls attending a graded high school.

27. There is no significant difference in the gain in attitude towards teachers (SOS) when comparing low-ability girls attending a nongraded high school with low-ability girls attending a graded high school.

28. There is no significant difference in the gain in attitude towards teachers (SOS) when making a total comparison of students attending a nongraded high school with students attending a graded high school.

Attitude towards the school's educational program. 29. There is no significant difference in the gain in attitude towards the school's educational program (SOS) when comparing high-ability boys attending a nongraded high school with high-ability boys attending a graded high school.

30. There is no significant difference in the gain in attitude towards the school's educational program (SOS) when comparing average-ability boys attending a nongraded high school with average-ability boys attending a graded high school.

31. There is no significant difference in the gain in attitude towards the school's educational program (SOS) when comparing low-ability boys attending a nongraded high school with low-ability boys attending a graded high school.

32. There is no significant difference in the gain in attitude towards the school's educational program (SOS) when comparing high-ability girls attending a nongraded high school with high ability girls attending a graded high school.

33. There is no significant difference in the gain in attitude towards the school's educational program (SOS) when comparing average-ability girls attending a nongraded high school with average-ability girls attending a graded high school.

34. There is no significant difference in the gain in attitude towards the school's educational program (SOS) when comparing low-ability girls attending a nongraded high school with low-ability girls attending a graded high school.

35. There is no significant difference in the gain in attitude towards the school's educational program (SOS) when making a total school comparison of students attending a nongraded high school with students attending a graded high school.

Educational value. 36. There is no significant difference in the gain in educational value (SOS) when comparing high-ability boys attending a nongraded high school with high-ability boys attending a graded high school.

37. There is no significant difference in the gain in educational value (SOS) when comparing average-ability boys attending a nongraded high school with average-ability boys attending a graded high school.

38. There is no significant difference in the gain in educational value (SOS) when comparing low-ability boys attending a nongraded high school with low-ability boys attending a graded high school.

39. There is no significant difference in the gain in educational value (SOS) when comparing high-ability girls attending a nongraded high school with high-ability girls attending a graded high school.

40. There is no significant difference in the gain in educational value (SOS) when comparing average-ability girls attending a nongraded high school with average-ability girls attending a graded high school.

41. There is no significant difference in the gain in educational value (SOS) when comparing low-ability girls attending a nongraded high school with low-ability girls attending a graded high school.

42. There is no significant difference in the gain in educational value (SOS) when making a total school comparison of students attending a nongraded high school with students attending a graded high school.

Critical thinking hypotheses

43. There is no significant difference in the gain in critical thinking (W-G) when comparing high-ability boys attending a nongraded high school with high-ability boys attending a graded high school.

44. There is no significant difference in the gain in critical thinking (W-G) when comparing average-ability boys attending a non-graded high school with average-ability boys attending a graded high school.

45. There is no significant difference in the gain in critical thinking (W-G) when comparing low-ability boys attending a nongraded high school with low-ability boys attending a graded high school.

46. There is no significant difference in the gain in critical thinking (W-G) when comparing high-ability girls attending a nongraded high school with high-ability girls attending a graded high school.

47. There is no significant difference in the gain in critical thinking (W-G) when comparing average-ability girls attending a nongraded high school with average-ability girls attending a graded high school.

48. There is no significant difference in the gain in critical thinking (W-G) when comparing low-ability girls attending a nongraded high school with low-ability girls attending a graded high school.

49. There is no significant difference in the gain in critical thinking ability (W-G) when making a total school comparison of students attending a nongraded high school with students attending a graded high school.

Interaction effect hypotheses

School and sex. 50. The factors of school and the sex of the student act independently of each other in affecting reading comprehension (CAT) scores of the students and, therefore, are not characterized by a significant interaction effect.

51. The factors of school and the sex of the students act independently of each other in affecting mathematic reasoning (CAT) scores of the students and, therefore, are not characterized by a significant interaction effect.

52. The factors of school and the sex of the student act independently of each other in affecting mechanics of English (CAT) scores of the students and, therefore, are not characterized by a significant interaction effect.

53. The factors of school and the sex of the students act independently of each other in affecting attitude towards teachers (SOS) scores of the students and, therefore, are not characterized by a significant interaction effect.

54. The factors of school and the sex of the student act independently of each other in affecting attitude towards the schools educational program (SOS) scores of the students and, therefore, are not characterized by a significant interaction effect.

55. The factors of school and the sex of the student act independently of each other in affecting educational value (SOS) scores of the students and, therefore, are not characterized by a significant effect.

56. The factors of school and the sex of the student act independently of each other in affecting critical thinking (W-G) scores of the students and, therefore, are not characterized by a significant interaction effect.

School and ability level. 57. The factors of school and the ability-level of the student act independently of each other in affecting reading comprehension (CAT) scores of the students and, therefore, are not characterized by a significant interaction effect.

58. The factors of school and the ability-level of the students act independently of each other in affecting mathematic reasoning (CAT) scores of the students and, therefore, are not characterized by a significant interaction effect.

59. The factors of school and the ability-level of the student act independently of each other in affecting mechanics of English (CAT) scores of the students and, therefore, are not characterized by a significant interaction effect.

60. The factors of school and the ability-level of the student act independently of each other in affecting attitude towards teachers (SOS) scores of the students and, therefore, are not characterized by a significant interaction effect.

61. The factors of school and the ability-level of the student act independently of each other in affecting attitude towards the schools educational program (SOS) scores of the nongraded students and, therefore, are not characterized by a significant interaction effect.

62. The factors of school and the ability-level of the students act independently of each other in affecting educational value (SOS) scores of the students and, therefore, are not characterized by a significant interaction effect.

63. The factors of school and the ability-level of the student act independently of each other in affecting critical thinking (W-G) scores of the students and, therefore, are not characterized by a significant interaction effect.

In summary, the study investigated the differences among the mean gains of six conditions (groups) in each of the two schools. The conditions represent the school, ability level and sex of the students. Conditions 1 through 6 designated the graded students; conditions 7 through 12 designate the nongraded students. The six conditions of the two schools presented 6 possible between-groups comparisons. In all, there were forty-nine between treatment comparisons made between the two schools. Of the number, 42 were comparisons of like groups of the two schools and seven were total comparisons between all the sample members of the two different schools on each of the seven variables. This number is not inclusive of the fourteen hypotheses of interaction effect that were tested between the treatment and ability-levels and between the treatment and sexes.

FINDINGS

The statistical technique used in the study was analysis of variance. As mentioned earlier, the value of this technique is useful when the significance of the difference among several means is desired. The computer program was designed to provide the necessary analysis while allowing for the unequal sizes of the cells (group number) making up the design of this study. In reference to the design of this study, the reader is reminded that there were two (2) schools whose sample members were stratified into sexes (2), who were then placed into one of three (3) ability levels; thus producing the 2 x 2 x 3 design which was figurally presented earlier.

The analysis of variance program computed the various group means for the seven variables and also provided F ratios which are overall tests of whether significant differences existed among the means. As pointed out by Garrett (1958, p. 284) a significant F does not tell which means differ significantly but ". . . if F is significant, we may proceed to test the separate differences by the t test." Therefore, the t test was employed to determine if the mean differences between the like groups on the pre and post test were significantly different. A .05 level of significance was adopted for determining whether the comparison hypotheses were retained or rejected. The standard error (SE) used in determining the t value of each like-group comparison was the pooled standard error of all the group means for each particular variable. The t value necessary for significance at the .05 level, with 72 df, is 2.00. Therefore, any t value found to be 2.00 or greater demanded a rejection of the null hypothesis being tested.

The .05 level of significance was also used in the acceptance or rejection of the "total" hypotheses which involved comparing all sample members of the two schools on each of the seven variables. The tabular data presented when discussing these hypotheses will be that data provided through analysis of variance and which was necessary for the computation of F ratios. The method of testing the different interaction hypotheses will be discussed later when preventing the interaction data.

The reader will recall that each comparison in this study was specifically stated as a hypothesis. This researcher feels that if a test for significance is important enough to include in a study, it should be stated specifically as a hypothesis. Each of the hypotheses will again be repeated in this chapter as the related findings are presented and the hypotheses are individually accepted or rejected. The repetitious style of presenting the data was maintained to enhance the reader's ability to locate the results of specific hypotheses. Readers interested in knowing the standard deviations of the pre-tests and post-tests can obtain this information from the more complete tables in the appendix. The reader is again reminded that the number of sample numbers in each group remained constant for all hypotheses. These numbers (N) may be obtained by referring to Table 1.

Comparison Hypotheses

Reading comprehension

The Reading Comprehension (CAT) instrument used to test the following reading hypotheses was designed to reveal the student's comprehension of what he reads, such as comprehending factual information, making proper inferences, and drawing valid conclusions from materials read. Table 4 on the following page presents the data used to test the following six reading hypotheses. Table 5 presents the data used to test hypothesis 7.

Hypothesis 1. There is no significant difference in the gain in reading comprehension (CAT) when comparing high-ability boys attending a nongraded high school with high-ability boys attending a graded high school.

The comparison of high-ability boys of the two schools in reading comprehension revealed no significant difference. The nongraded boys exceeded the graded boys in their mean difference score between the pre-test and post-test but the t value of 1.08 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 2. There is no significant difference in the gain in reading comprehension (CAT) when comparing average-ability boys attending a nongraded high school with average-ability boys attending a graded high school.

The comparison of average-ability boys of the two schools in reading comprehension revealed no significant difference. The graded boys exceeded the nongraded boys in their mean difference score between pre-test and

Table 4. Comparison of nongraded and graded groups on reading comprehension (CAT)

	Pre-tests	Post tests	Difference			
Groups	Mean	Mean	Mean	S.D.	Diff.	*t* value
G, low, boys	30.45	29.45	1.00	7.13	.14	.057
NG, low, boys	32.57	31.71	.86	7.38		
G, av., boys	38.84	44.27	5.42	7.88	1.37	.55
NG, av., boys	39.46	43.51	4.05	7.61		
G, high, boys	48.39	57.28	8.89	5.12	2.67	1.08
NG, high, boys	47.30	58.87	11.56	5.66		
G, low, girls	30.56	31.25	.69	6.38	1.22	.49
NG, low, girls	32.16	31.63	-.53	7.22		
G, av., girls	37.84	41.72	3.88	6.21	.43	.17
NG, av., girls	40.16	44.47	4.31	6.37		
G, high, girls	48.82	56.41	7.59	6.01	1.01	.41
NG, high, girls	47.60	56.20	8.60	4.87		

Alpha: .05
df: 72
SE = 2.476
Region of rejection: $t \geq 2.00$

post-test but the t test of .55 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 3. There is no significant difference in the gain in reading comprehension (CAT) when comparing low-ability boys attending a nongraded high school with low-ability boys attending a graded high school.

The comparison of low-ability boys of the two schools in reading comprehension revealed no significant difference in their scores. The graded boys exceeded the nongraded boys in their mean difference score between the pre-test and post-test but the t value of .057 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 4. There is no significant difference in the gain in reading comprehension (CAT) when comparing high-ability girls attending a nongraded high school with high-ability girls attending a graded high school.

The comparison of high-ability girls of the two schools in reading comprehension revealed no significant difference in scores. The nongraded girls exceeded the graded girls in their mean difference score between the pre-test and post-test but the t balue of .41 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 5. There is no significant difference in the gain in reading comprehension (CAT) when comparing average-ability girls attending a nongraded high school with high-ability girls attending a graded high school.

The comparison of average-ability girls of the two schools in reading comprehension revealed no significant difference in their scores. The nongraded girls exceeded the graded girls in their mean difference scores between the pre-test and post-test but the t value of .17 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 6. There is no significant difference in the gain in reading comprehension (CAT) when comparing low-ability girls attending a nongraded high school with low-ability girls attending a graded high school.

The comparison of low-ability girls of the two schools in reading comprehension revealed no significant difference in their scores. The graded girls exceeded the nongraded girls in their mean difference scores between the pre-test and post-test but the t value of .49 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 7. There is no significant difference in the gain in reading comprehension (CAT) when making a total-school comparison of students attending a nongraded high school with students attending a graded high school.

Table 5. Comparison of all nongraded and all graded students on reading comprehension (CAT)

Source of variation	Sum of squares	df	Mean squares	F	Signif. level
School	4.197	1	4.197	.097	.75
Error	11589.952	270	42.926		

Alpha: .05

.75 is not significant
The hypothesis is retained.

In reading comprehension, the F value of .097 was found to have a .75 level of significance. Therefore, there was no significant difference in reading comprehension between the nongraded and graded schools when making a total-school comparison.

None of the like-groups of the two schools were found to have a significantly greater gain over the other in reading comprehension. In fact, each school slightly surpassed the other in three of the six comparisons. In addition, no significant difference was revealed when comparing the total samples of the two schools. Both the low-ability boys and low-ability girls of the graded school made greater gains than their parallel groups in the nongraded school. The outcome was reversed in the case of the high-ability students in that the nongraded boys and girls made greater gains than the graded student. Table 4 also reveals that in both schools the boys made higher mean gains than the girls in all ability levels except in one comparison where the average-ability girls of nongraded school were found to have made a greater gain than the boys of the same school. The two schools also showed similarity by the higher-ability students making the greatest reading gains.

Mathematic reasoning

The Mathematic Reasoning (CAT) subtest was used to test hypotheses 8 through 14. The test contains mathematical items which were designed to reveal the degree of functional ability rather than to include long and involved problems in the solution of which differences in attention span may operate as an additional variable. Table 6 on the following page presents the data used

Table 6. Comparison of nongraded and graded groups on mathematic reasoning (CAT)

Groups	Pre-tests Mean	Post tests Mean	Difference Mean	Difference S. D.	Diff.	_t_ value
G, low, boys	30.00	30.54	.54	3.96	1.03	.49
NG, low, boys	29.28	30.85	1.57	4.96		
G, av., boys	38.42	42.00	3.58	4.14	2.32	1.11
NG, av., boys	37.64	38.90	1.26	6.54		
G, high, boys	42.61	47.46	4.86	6.70	3.60	1.72
NG, high, boys	46.96	48.22	1.26	5.31		
G, low, girls	28.19	30.56	2.37	4.18	5.53	2.65**
NG, low, girls	28.63	25.47	-3.16	4.79		
G, av., girls	32.00	34.72	2.72	5.46	4.40	2.11*
NG, av., girls	35.60	33.92	-1.68	6.33		
G, high, girls	41.82	45.65	3.82	3.57	1.82	.87
NG, high, girls	42.67	44.67	2.00	5.12		

SE = 2.087
df = 72
* _t_ of 2.00 required for significance at the .05 level.
** _t_ of 2.65 required for significance at the .01 level.

to test the following six mathematic hypotheses.

Hypothesis 8. There is no significant difference in the gain in mathematic reasoning (CAT) when comparing high-ability boys attending a nongraded high school with high-ability boys attending a graded high school.

The comparison of high-ability boys of the two schools in mathematic reasoning revealed no significant difference. The graded boys exceeded the nongraded boys in their mean scores between the pre-test and post-test but the t value of 1.72 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 9. There is no significant difference in the gain in mathematic reasoning (CAT) when comparing average-ability boys attending a nongraded high school with average-ability boys attending a graded high school.

The comparison of average-ability boys of the two schools in mathematic reasoning revealed no significant difference. The graded boys exceeded the nongraded boys in their mean scores between the pre-test and post-test but the t value of 1.11 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 10. There is no significant difference in the gain in mathematic reasoning (CAT) when comparing low-ability boys attending a nongraded high school with low-ability boys attending a graded high school.

The comparison of low-ability boys of the two schools in mathematic reasoning revealed no significant difference. The nongraded boys exceeded the graded boys in their mean difference scores between pre-test and post-test but the t value of .49 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 11. There is no significant difference in the gain in mathematic reasoning (CAT) when comparing high-ability girls attending a nongraded high school with high-ability girls attending a graded high school.

The comparison of high-ability girls of the two schools in mathematic reasoning revealed no significant difference. Graded girls exceeded the nongraded girls in their mean difference scores between pre-test and post-test but the t value of .87 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 12. There is no significant difference in the gain in mathematic reasoning (CAT) when comparing average-ability girls attending a nongraded high school with average-ability girls attending a graded high school.

The comparison of average-ability girls of the two schools in mathematic reasoning revealed a significant difference which favored the graded girls. This difference possessed a t value of 2.11 which exceeds the value of 2.00 required for significance at the .05 level. The hypothesis is rejected.

Hypothesis 13. There is no significant difference in the gain in mathematic reasoning (CAT) when comparing low-ability girls attending a nongraded high school with low-ability girls attending a graded high school.

The comparison of low-ability girls of the two schools in mathematic reasoning revealed a significant difference. This difference possessed a t value of 2.65 which is the exact value required for significance at the .01 level.

The hypothesis is rejected.

Hypothesis 14. There is no significant difference in the gain in mathematic reasoning (CAT) when making a total-school comparison of students attending a nongraded high school with students attending a graded high school.

Table 7. Comparison of all nongraded and all graded students on mathematic reasoning (CAT)

Source of variation	Sum of squares	df	Mean squares	F	Signif. level
School	415.586	1	415.586	13.634	.0005
Error	8229.695	270	30.480353		
Alpha: .05			.0005 is significant. The hypothesis is rejected.		

In mathematic reasoning, the F value of 13.634 was found to have a .0005 level of significance. The hypothesis is rejected in that there was significant difference in mathematic reasoning between the nongraded and graded schools when making a total-school comparison. The significance, which favored the graded school, is evidenced by comparing the "gain" difference made by the two schools; 3.227 for the graded students and -.035 for the nongraded students.

Two comparison groups of the graded school made significantly greater gains in mathematic reasoning than did their counter groups of the nongraded school. These two groups which showed significance were the average-ability girls and the low-ability girls. In addition, students of the graded school slightly surpassed, though not significantly, the nongraded students in three of the four other comparison groups. A comparison of the two schools by combining all the ability levels showed the graded students to perform significantly better than the nongraded students.

Mechanics of English

The Mechanics of English (CAT) instrument consisted of three sections --Capitalization, Punctuation, and Word Usage. Table 8 on the following page presents the data used to test hypotheses 15 through 21.

Hypothesis 15. There is no significant difference in the gain in mechanics of English (CAT) when comparing high-ability boys attending a nongraded high school with high-ability boys attending a graded high school.

The comparison of high-ability boys of the two schools in mechanics of English revealed no significant difference. The nongraded boys exceeded the graded boys in their mean difference score between the pre-test and post-test but the t value of .28 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 16. There is no significant difference in the gain in mechanics of English (CAT) when comparing average-ability boys attending a nongraded high school with average-ability boys attending a graded high school.

Table 8. Comparison of nongraded and graded groups on mechanics of English (CAT)

Groups	Pre-tests Mean	Post-tests Mean	Difference Mean	Difference S.D.	Diff.	t value
G, low, boys	82.91	94.45	11.54	11.52	6.83	1.69
NG, low, boys	82.71	87.43	4.71	9.09		
G, av., boys	97.54	104.65	7.11	11.44	.91	.22
NG, av., boys	93.31	101.33	8.02	11.10		
G, high, boys	110.28	113.36	3.07	14.96	1.15	.28
NG, high, boys	111.13	115.35	4.22	10.99		
G, low, girls	93.81	101.50	7.69	6.48	.90	.22
NG, low, girls	91.95	98.74	6.79	10.89		
G, av., girls	106.19	112.00	5.81	9.64	2.94	.73
NG, av., girls	105.68	108.55	2.87	10.93		
G, high, girls	117.18	125.59	8.41	7.95	6.34	1.57
NG, high, girls	119.33	121.40	2.07	5.17		

Alpha: .05
SE = 4.048
df = 72
Region of rejection: $t \geq 2.00$

The comparison of average-ability boys of the two schools in mechanics of English revealed no significant difference. The nongraded boys exceeded the graded boys in their mean difference score between the pre-test and post-test but the t value of .22 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 17. There is no significant difference in the gain in mechanics of English (CAT) when comparing low-ability boys attending a nongraded high school with low-ability boys attending a graded high school.

The comparison of low-ability boys of the two schools in mechanics of English revealed no significant difference in their scores. The graded boys exceeded the nongraded boys in their mean difference score between the pre-test and post-test but the t value of 1.69 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 18. There is no significant difference in the gain in mechanics of English (CAT) when comparing high-ability girls attending a nongraded high school with high-ability girls attending a graded high school.

The comparison of high-ability girls of the two schools in mechanics of English revealed no significant difference in their scores. The graded girls exceeded the nongraded girls in their mean difference scores between the pre-test and post-test but the t value of 1.57 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 19. There is no significant difference in the gain in mechanics of English (CAT) when comparing average-ability girls attending a nongraded high school with average-ability girls attending a graded high school.

The comparison of average ability girls of the two schools in mechanics of English revealed no significant difference in scores. The graded girls exceeded the nongraded girls in their mean difference score between the pre-test and post-test but the t value of .73 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 20. There is no significant difference in the gain in mechanics of English (CAT) when comparing low-ability girls attending a nongraded high schools with low-ability girls attending a graded high school.

The comparison of low-ability girls of the two schools in mechanics of English revealed no significant difference in scores. The graded girls exceeded the nongraded girls in their mean score between the pre-test and post-test but the t value of .22 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 21. There is no significant difference in the gain in mechanics of English (CAT) when making a total-school comparison of students attending a nongraded high school with students attending a graded high school.

In mechanics of English, the F value of 2.926 was found to have a .08 level of significance. Therefore, with an adopted significance level of .05 there was no significant difference in mechanics of English between the nongraded and graded schools when making a total-school comparison.

No comparison group of either school made a significant gain over the parallel group of the other school in mechanics of English. Though not significant,

Table 9. Comparisons of all nongraded and all graded students on mechanics of English (CAT)

Source of variation	Sum of squares	df	Mean squares	F	Signif. level
School	335.568	1	335.568	2.926	.08
Error	30964.053	270	114.682		

Alpha: .05

.08 is not significant.
The hypothesis is retained

the raw score data showed the graded students to score slightly better than the nongraded students in four of the six comparisons. A comparison of the two schools by combining all ability levels showed there to be no significant difference.

The reader may find it of interest in reading Table 8 to note that in both schools all levels of girls scored approximately 9 per cent higher than the boys on both the pre-test and post-test.

Attitude toward teachers

The subscale "Attitude Towards Teachers," which is the first subscale of Borg's Student Opinion Survey, was used to test the attitudinal hypothesis 22 through 28. The items of this instrument were aimed at measuring those aspects of the student's attitude towards the school situation which relate specifically to his teachers.

Hypothesis 22. There is no significant difference in the gain in attitude towards teachers (SOS) when comparing high-ability boys attending a nongraded high school with high-ability boys attending a graded high school.

The comparison of high-ability boys of the two schools in attitude towards teachers revealed no significant difference. The graded boys exceeded the nongraded boys in their mean scores between the pre-test and post-test but the t value of .51 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 23. There is no significant difference in the gain in attitude towards teachers (SOS) when comparing average-ability boys attending a nongraded high school with average-ability boys attending a graded high school.

The comparison of average-ability boys of the two schools in attitude towards teachers revealed no significant difference. The graded boys exceeded the nongraded boys in their mean scores between the pre-test and post-test but the t value of .27 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 24. There is no significant difference in the gain in attitude towards teachers (SOS) when comparing low-ability boys attending a nongraded high school with low-ability boys attending a graded high school.

The comparison of low-ability boys of the two schools in attitude towards teachers revealed no significant difference. The graded boys exceeded the nongraded boys in their mean scores between the pre-test and post-test

Table 10. Comparison of nongraded and graded groups on attitude towards teachers (SOS)

	Pre-tests	Post-tests	Difference			
Groups	Mean	Mean	Mean	S. D.	Diff.	t value
G, low, boys	52.91	52.09	-.82	7.31	2.75	1.26
NG, low, boys	55.00	51.43	-3.57	9.19		
G, av., boys	54.11	53.50	-.61	5.99	.59	.27
NG, av., boys	53.43	52.23	-1.20	5.41		
G, high, boys	54.18	54.86	.68	6.43	1.11	.51
NG, high, boys	53.61	53.17	-.43	4.09		
G, low, girls	55.75	53.31	-2.44	5.46	1.76	.80
NG, low, girls	53.89	53.21	-.68	7.68		
G, av., girls	54.00	53.12	-.88	4.69	.04	.02
NG, av., girls	53.84	52.92	-.92	5.71		
G, high, girls	55.82	57.35	1.53	5.83	1.47	.68
NG, high, girls	56.27	56.33	.06	4.03		

Alpha: .05
SE = 2.176
df = 72
Region of rejection: $t \geq 2.00$

but the t value of 1.26 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 25. There is no significant difference in the gain in attitude towards teachers (SOS) when comparing high-ability girls attending a nongraded high school with high-ability girls attending a graded high school.

The comparison of high ability girls of the two schools in attitude towards teachers revealed no significant difference. The graded girls exceeded the nongraded girls in their mean scores between the pre-test and post-test but the t value of .68 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 26. There is no significant difference in the gain in attitude towards teachers (SOS) when comparing average-ability girls attending a nongraded high school with average-ability girls attending a graded high school.

The comparison of average-ability girls of the two schools in attitude towards teachers revealed no significant difference. Graded girls exceeded the nongraded girls in their mean scores between the pre-test and post-test but the t value of .02 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 27. There is no significant difference in the gain in attitude towards teachers (SOS) when comparing low-ability girls attending a nongraded high school with low-ability girls attending a graded high school.

The comparison of low-ability girls of the two schools in attitude towards teachers revealed no significant difference. Nongraded girls exceeded the graded girls in their mean scores between the pre-test and post-test but the t value of .80 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 28. There is no significant difference in the gain in attitude towards teachers (SOS) when making a total-school comparison of students attending a nongraded high school with students attending a graded high school.

Table 11. Comparison of all nongraded and all graded students on attitude towards teachers (SOS)

Source of variation	Sum of squares	df	Mean squares	F	Signif. level
School	26.476	1	26.476	.799	.63
Error	8948.016	270	33.140		

Alpha: .05

.63 is not significant
The hypothesis is retained.

In attitude towards teachers, the F value of .799 was found to have a .75 level of significance. Therefore, there was no significant difference in attitude towards teachers between the nongraded and graded schools when making a total-school comparison.

None of the compared groups of the two schools were found to have a significant gain in attitude towards teachers. Though not significant, the raw score data showed the graded students to score slightly better than the nongraded students in five of the six comparisons of like groups. Regrettably, students' attitude towards teachers became less positive between the testing sessions in nine of the twelve groups. A comparison of the two schools by combining all ability levels showed there to be no significant difference.

Attitude towards the school's education program

The students' attitude towards the school's educational program was compared by using the second subscale of Borg's Student Opinion Survey which has the same title as the attitude it measures. The subscale is concerned with the specific educational program and curriculum of the school. Table 12 on the following page presents the data used in testing the next six hypotheses.

Hypothesis 29. There is no significant difference in the gain in attitude towards the school's educational program (SOS) when comparing high-ability boys attending a nongraded high school with high-ability boys attending a graded high school.

The comparison of high-ability boys of the two schools in attitude towards the school's educational program revealed no significant difference in their scores. The graded boys exceeded the nongraded boys in their mean difference score between the pre-test and post-test but the t value of .18 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 30. There is no significant difference in the gain in attitude towards the school's educational program (SOS) when comparing average-ability boys attending a nongraded high school with average-ability boys attending a graded high school.

Table 12. Comparison of nongraded and graded groups on attitude towards the schools' educational program (SOS)

Groups	Pre-tests Mean	Post-tests Mean	Difference Mean	Difference S. D.	Diff.	_t_ value
G, low, boys	59.91	57.00	-2.91	7.03	3.48	1.24
NG, low, boys	59.28	59.85	.57	4.86		
G, av., boys	57.96	58.50	.54	5.80	3.00	1.07
NG, av., boys	60.18	57.71	-2.46	7.93		
G, high, boys	59.86	60.28	.42	8.84	.50	.18
NG, high, boys	60.78	60.69	-.08	8.45		
G, low, girls	61.00	60.00	1.00	7.89	5.69	2.03*
NG, low, girls	61.95	57.26	-4.69	6.24		
G, av., girls	61.39	58.91	-2.49	8.09	.97	.35
NG, av., girls	60.97	59.45	-1.52	6.62		
G, high, girls	63.23	60.41	-2.82	7.01	1.63	.58
NG, high, girls	61.86	60.67	-1.19	6.79		

Alpha: .05
SE = 2.817
df = 72
*Region of rejection: $t \geq 2.00$

The comparison of average-ability boys of the two schools in attitude towards the school's educational program revealed no significant difference in their scores. The graded boys exceeded the nongraded boys in their mean difference score between the pre-test and post-test but the t value of 1.07 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 31. There is no significant difference in the gain in attitude towards the school's educational program (SOS) when comparing low-ability boys attending a nongraded high school with low-ability boys attending a graded high school.

The comparison of low-ability boys of the two schools in attitude towards the school's educational program revealed no significant difference in their scores. The nongraded boys exceeded the graded boys in their mean difference score between the pre-test and post-test but the t value of 1.24 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 32. There is no significant difference in the gain in attitude towards the school's educational program (SOS) when comparing high-ability girls attending a nongraded high school with high-ability girls attending a graded high school.

The comparison of high-ability girls of the two schools in attitude towards the school's educational program revealed no significant difference in their scores. The nongraded girls exceeded the graded girls in their mean difference score between the pre-test and post-test but the t value of .58 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 33. There is no significant difference in the gain in attitude towards the school's educational program (SOS) when comparing average-ability girls attending a nongraded high school with average-ability girls attending a graded high school.

The comparison of average-ability girls of the two schools in attitude towards the school's educational program revealed no significant difference in their scores. The nongraded girls exceeded the graded girls in their mean difference score between the pre-test and post-test but the t value of .35 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 34. There is no significant difference in the gain in attitude towards the school's educational program (SOS) when comparing low-ability girls attending a nongraded high school with low-ability girls attending a graded high school.

The comparison of low-ability girls of the two schools in attitude towards the school's educational program revealed a significant difference which favored the graded students. This difference resulted in a t value of 2.03 which exceeds the value of 2.00 required for significance at the .05 level. The hypothesis is rejected.

Hypothesis 35. There is no significant difference in the gain in attitude towards the school's educational program (SOS) when making a total-school comparison of students attending a nongraded high school with students attending a graded high school.

Table 13. Comparison of all nongraded and all graded students on attitude towards the school's educational program (SOS)

Source of variation	Sum of squares	df	Mean squares	F	Signif. level
School	1.925	1	1.925	.034	.85
Error	15000.654	270	55.557		

Alpha: .05

.85 is not significant
The hypothesis is retained.

In attitude towards the school's educational program, the F value of .034 was found to have a .85 level of significance. Therefore, there was no significant difference in attitude towards the school's education program between the nongraded and graded schools when making a total-school comparison.

In the first six comparisons, only the low-ability girls of the graded school were found to have made a significantly greater gain than their parallel group. In three of the other five comparisons the nongraded students slightly exceeded, though not significantly, the graded students. Regrettably, the attitude become less favorable between the testing sessions in three of the six comparison groups of the graded school and less favorable in five of the six groups of the nongraded school. A comparison of the two schools by combining all the ability levels showed there to be no significant difference.

Educational values

Borg's third subscale, "Educational Values" was the instrument used to measure the students' attitude toward the importance of education. It was primarily designed to indicate the degree to which the student values education or a means of attaining his future goals. Table 14 on the following page presents the data used to test the following six hypotheses.

Hypothesis 36. There is no significant difference in the gain in educational value (SOS) when comparing high-ability boys attending a nongraded high school with high-ability boys attending a graded high school.

The comparison of high-ability boys of the two schools in educational values revealed no significant difference. The graded boys exceeded the nongraded boys in their mean difference scores between scores between the pre-test and post-test but the t value of .75 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 37. There is no significant difference in the gain in educational value (SOS) when comparing average-ability boys attending a nongraded high school with average-ability boys attending a graded high school.

The comparison of average-ability boys of the two schools in educational values revealed no significant difference. The nongraded boys exceeded the graded boys in their mean difference scores between the pre-test and post-test but the t value of .70 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 38. There is no significant difference in the gain in educational value (SOS) when comparing low-ability boys attending a non-graded high school with low-ability boys attending a graded high school.

Table 14. Comparison of nongraded and graded groups on educational value (SOS)

Groups	Pre-tests Mean	Post tests Mean	Difference Mean	Difference S.D.	Diff.	t value
G, low, boys	63.09	65.18	2.09	7.51	8.23	3.15**
NG, low, boys	68.86	62.71	-6.14	11.07		
G, av., boys	69.42	65.92	-3.50	7.41	1.84	.70
NG, av., boys	68.51	66.85	-1.66	6.77		
G, high, boys	66.11	66.43	.32	6.80	1.97	.75
NG, high, boys	69.69	68.04	-1.65	5.99		
G, low, girls	65.75	63.69	-2.06	7.59	2.68	1.03
NG, low, girls	68.05	63.31	-4.74	8.70		
G, av., girls	67.81	66.74	-1.07	5.09	.20	.08
NG, av., girls	66.31	65.45	-.87	6.56		
G, high, girls	69.23	67.82	-1.41	7.25	2.60	1.00
NG, high, girls	66.00	67.20	1.19	6.67		

SE = 2.606
df = 72
* t value of 2.00 required for significance at the .05 level.
** t value of 2.65 required for significance at the .01 level.

The comparison of low-ability boys of the two schools in educational values revealed a significant difference which favored the graded students. This difference possessed a t value of 3. 15 which exceeded the value of 2. 65 required for significance at the . 01 level. The hypothesis is rejected.

Hypothesis 39. There is no significant difference in the gain in educational value (SOS) when comparing high-ability girls attending a nongraded high school with high-ability girls attending a graded high school.

The comparison of high-ability girls of the two schools is educational values revealed no significant difference. The nongraded girls exceeded the graded girls in their mean difference scores between the pre-test and post-test but the t value of 1. 00 was not significant at the . 05 level. The hypothesis is retained.

Hypothesis 40. There is no significant difference in the gain in educational value (SOS) when comparing average-ability girls attending a nongraded high school with average-ability girls attending a graded high school.

The comparison of average-ability girls of the two schools in educational values revealed no significant difference. The nongraded girls exceeded the graded girls in their mean difference scores between the pre-test and post-test but the t value of . 08 was not significant at the . 05 level. The hypothesis is retained.

Hypothesis 41. There is no significant difference in the gain in educational value (SOS) when comparing low-ability girls attending a nongraded high school with low-ability girls attending a graded high school.

The comparison of low-ability girls of the two schools in educational values revealed no significant difference. The graded girls exceeded the nongraded girls in their mean difference scores between the pre-test and post-test but the t value of 1.03 was not significant. The hypothesis is retained.

Hypothesis 42. There is no significant difference in the gain in educational value (SOS) when making a total-school comparison of students attending a nongraded high school with students attending a graded high school.

Table 15. Comparison of all nongraded and all graded students on educational value (SOS)

Source of variation	Sum of squares	df	Mean squares	F	Signif. level
School	101.639	1	101.639	2.137	.14
Error	12838.529	270	47.550		

Alpha: .05

.14 is not significant.
The hypothesis is retained.

In educational value, the F value of 2.137 was found to have a .14 level of significance. Therefore, there was no significant difference in educational value between the nongraded and graded schools when making a total-school comparison.

Only one comparison group was found to have made significant gain over its counter group of the other school in educational value. In this case the low-ability boys of the graded school were found to be significantly (.01

level) more favorable in educational values. In three of the other five comparisons the mean difference scores favored, though not significantly, the nongraded students. A comparison of the two schools by combining all ability levels showed there to be no significant difference.

Critical thinking

The Watson-Glaser Critical Thinking Appraisal was used to measure the extent to which the students have mastered certain critical thinking skills and thus provide a partial estimate of the extent to which this trait has been achieved. Table 16 on the following page presents the data used in testing the following six hypotheses.

Hypothesis 43. There is no significant difference in the gain in critical thinking (W-G) when comparing high-ability boys attending a nongraded high school with high-ability boys attending a graded high school.

The comparison of high-ability boys of the two schools in critical thinking revealed no significant difference in their scores. The graded boys exceeded the nongraded boys in their mean difference score between the pre-test and post-test but the t value of .23 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 44. There is no significant difference in the gain in critical thinking (W-G) when comparing average-ability boys attending a nongraded high school with average-ability boys attending a graded high school.

The comparison of average-ability boys in critical thinking revealed no significant difference in their scores. The nongraded boys exceeded the

Table 16. Comparison of nongraded and graded groups on critical thinking ability (W-G)

Groups	Pre-tests Mean	Post-tests Mean	Difference Mean	Difference S.D.	Diff.	*t* value
F, low, boys	47.73	54.09	6.36	12.94	1.65	.58
NG, low, boys	45.71	50.43	4.71	5.61		
G, av., boys	58.42	59.42	1.00	7.14	.46	.16
NG, av., boys	59.23	60.69	1.46	6.98		
G, high, boys	67.28	69.36	2.07	5.90	.64	.23
NG, high, boys	65.91	67.35	1.43	8.90		
G, low, girls	49.44	53.50	4.06	7.27	.41	.14
NG, low, girls	53.26	57.74	4.47	9.35		
G, av., girls	57.81	59.21	1.40	7.39	.81	.29
NG, av., girls	60.47	62.68	2.21	6.11		
G, high, girls	65.06	68.65	3.59	7.54	.95	.33
NG, high, girls	63.33	67.87	4.54	6.68		

Alpha: .05
SE = 2.841
df = 72
Region of Rejection: $t \geq 2.00$

graded boys in their mean difference score between the pre-test and post-test but the t value of .16 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 45. There is no significant difference in the gain in critical thinking (W-G) when comparing low-ability boys attending a nongraded high school with low-ability boys attending a graded high school.

The comparison of low-ability boys in critical thinking revealed no significant difference in their scores. Graded boys exceeded the nongraded boys in their mean difference score between the pre-test and post-test but the t value of .58 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 46. There is no significant difference in the gain in critical thinking (W-G) when comparing high-ability girls attending a nongraded high school with high-ability girls attending a graded high school.

The comparison of high-ability girls in critical thinking revealed no significant difference in their scores. Nongraded girls exceeded the graded girls in their mean difference score between the pre-test and post-test but the t value of .33 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 47. There is no significant difference in the gain in critical thinking (W-G) when comparing average-ability girls attending a nongraded high school with average ability girls attending a graded high school.

The comparison of average-ability girls in critical thinking revealed no significant difference in their scores. Nongraded girls exceeded the graded girls in their mean difference score between the pre-test and post-test but the t value of .29 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 48. There is no significant difference in the gain in critical thinking (W-G) when comparing low-ability girls attending a nongraded high school with low-ability girls attending a graded high school.

The comparison of low-ability girls of the two schools in critical thinking revealed no significant difference in their scores. Nongraded girls exceeded the graded girls in their mean difference score between the pre-test and post-test but the t value of .14 was not significant at the .05 level. The hypothesis is retained.

Hypothesis 49. There is no significant difference in the gain in critical thinking (W-G) when making a total-school comparison of students attending a nongraded high school with students attending a graded high school.

Table 17. Comparison of all nongraded and all graded students on critical thinking ability (W-G)

Source of variation	Sum of squares	df	Mean squares	F	Signif. level
School	.180	1	.180	.003	.95
Error	15253.295	270	56.493		

Alpha: .05

.95 is not significant.
The hypothesis is retained.

In critical thinking, the F value of .003 was found to have a .95 level of significance. Therefore, there was no significant difference in critical thinking ability between the nongraded and graded schools when making a total-school comparison.

In summary, none of the comparison groups in the hypotheses 43 through 48 were found to have made a significant gain over its counter group. Though not significant, the raw score data showed the nongraded students to score slightly better than the graded students on four of the six comparisons. A comparison of the two schools by combining all ability levels showed there to be no significant difference.

Interaction Hypotheses

In addition to the main effects which were hypothesized and tested, there is the possibility that interactions exist between the factors. In determining whether or not significant interactions occurred between the school and sex and between school and ability level, F values were calculated for these two kinds of interactions on each of the seven variables. These values (F) were obtained by dividing each interaction mean square by the error mean square for each particular variable. This interaction data is presented in tabular form immediately following the statement of each hypothesis. The significance of F values are readily determined by use of a standard F table but fortunately the computer program furnished the exact significance level for each interaction. If the numerical value of the derived significance level is greater than .05 it is not recognized as being significant in that a larger number indicates an increased chance that the difference was due to chance. When a significant value is derived, the data will be graphically presented to show why the interaction effect was significant.

School and sex

Hypothesis 50. The factors of school and the sex of the student act independently of each other in affecting reading comprehension (CAT) scores of the students and, therefore, are not characterized by a significant interaction effect.

Table 18. Interaction effect of school and sex on reading comprehension (CAT)

Source of variation	Sum of squares	df	Mean square	F	Signif. level
School X sex	2.206	1	2.206	.051	.72
Error	11589.952	270	42.925		

Alpha: .05

.72 is not significant
The hypothesis is retained.

In reading comprehension, the F value of .051 was found to have a .72 level of significance. Therefore, there was no significant interaction effect between the schools and sexes in reading comprehension. The hypothesis is retained.

Hypothesis 51. The factors of school and the sex of the student act independently of each other in affecting mathematic reasoning (CAT) scores of the students and, therefore, are not characterized by a significant interaction effect.

Table 19. Interaction effect of school and sex on mathematic reasoning (CAT)

Source of variation	Sum of squares	df	Mean square	F	Signif. level
School X sex	70.748	1	70.748	2.321	.12
Error	8229.695	270	30.480		

Alpha: .05

.12 is not significant.
The hypothesis is retained.

In mathematic reasoning, the F value of 2.321 was found to have a .12 level of significance. Therefore, there was no significant interaction effect between the schools and sexes in mathematic reasoning. The hypothesis is retained.

Hypothesis 52. The factors of school and the sex of the student act independently of each other in affecting mechanics of English (CAT) scores of the students and, therefore, are not characterized by a significant interaction effect.

Table 20. Interaction effect of school and sex on mechanics of English (CAT)

Source of variation	Sum of square	df	Mean square	F	Signif. level
School X sex	43.923	1	43.923	.383	.55
Error	30964.053	270	114.681		

Alpha: .05

.55 is not significant.
The hypothesis is retained.

In mechanics of English, the F value of .392 was found to have a .55 level of significance. Therefore, there was no significant interaction between the schools and sexes in mechanics of English. The hypothesis is retained.

Hypothesis 53. The factors of school and the sex of the students act independently of each other in affecting attitude towards teachers (SOS) scores of the students and, therefore, are not characterized by a significant interaction effect.

Table 21. Interaction effect of school and sex on attitude towards teachers (SOS)

Source of variation	Sum of squares	df	Mean square	F	Signif. level
School X sex	33.240	1	33.240	1.003	.32
Error	8948.015	270	33.140		

Alpha: .05

.32 is not significant.
The hypothesis is retained.

In attitude towards teachers, the F value of 1.003 was found to have a .32 level of significance. Therefore, there was no significant interaction between the schools and sexes in attitude towards teachers. The hypothesis is retained.

Hypothesis 54. The factors of school and the sex of the student act independently of each other in affecting attitude towards the school educational program (SOS) scores of the students and, therefore, are not characterized by a significant interaction effect.

Table 22. Interaction effect of school and sex on attitude towards the schools' educational program (SOS)

Source of variation	Sum of squares	df	Mean squares	F	Signif. level
School X sex	1.695	1	1.695	.035	.86
Error	15000.00	270	55.557		

Alpha: .05

.86 is not significant.
The hypothesis is retained.

In attitude towards the school educational program, the F value of .035 was found to have a .86 level of significance. Therefore, there was no significant interaction between the schools and sexes in attitude towards the school educational program. The hypothesis is retained.

Hypothesis 55. The factors of school and the sex of the student act independently of each other in affecting educational value (SOS) scores of the students and, therefore, are not characterized by a significant interaction effect.

Table 23. Interaction effect of school and sex on educational value (SOS)

Source of variation	Sum of squares	df	Mean square	F	Signif. level
School X sex	108.606	1	108.606	2.284	.13
Error	12838.529	270	47.550		

Alpha: .05

.15 is not significant.
The hypothesis is retained.

In educational value, the F value of 2.284 was found to have a .13 level of significance. Therefore, there was no significant interaction between the schools and sexes in educational value. The hypothesis is retained.

Hypothesis 56. The factors of school and the sex of the student act independently of each other in affecting critical thinking (W-G) scores of the students and, therefore, are not characterized by a significant interaction effect.

Table 24. Interaction effect of school and sex on critical thinking (W-G)

Source of variation	Sum of squares	df	Mean squares	F	Signif. level
School X sex	23.929	1	23.929	.423	.52
Error	15253.295	270	56.493		

Alpha: .05

.52 is not significant.
The hypothesis is retained.

In critical thinking, the F value of .423 was found to have a .52 level of significance. Therefore, there was no significant interaction between the schools and sexes in critical thinking. The hypothesis is retained.

School and ability level

Hypothesis 57. The factors of school and the ability-level of the students act independently of each other in affecting reading comprehension (CAT) scores of the students and, therefore, are not characterized by a significant interaction effect.

Table 25. Interaction effect of school and ability level on reading comprehension (CAT)

Source of variabion	Sum of squares	df	Mean squares	F	Signif. level
School X ability-level	65.953	2	32.976	.768	.53
Error	11589.952	270	42.925		

Alpha: .05

.53 is not significant.
The hypothesis is retained.

In reading comprehension, the F value of .768 was found to have a .53 level of significance. Therefore, there was no significant interaction between the schools and ability levels in reading comprehension. The hypothesis is retained.

Hypothesis 58. The factors of school and the ability-level of the students act independently of each other in affecting mathematic reasoning (CAT) scores of the students and, therefore, are not characterized by a significant interaction effect.

Table 26. Interaction effect of school and ability level on mathematic reasoning (CAT)

Source of variation	Sum of squares	df	Mean square	F	Signif. level
School X ability-level	11.182	2	5.591	.183	.83
Error	8229.695	270	30.480		
Alpha: .05			.83 is not significant. The hypothesis is retained.		

In mathematic reasoning, the F value of .183 was found to have a .83 level of significance. Therefore, there was no significant interaction between the schools and ability levels in mathematic reasoning. The hypothesis is retained.

Hypothesis 59. The factors of school and ability-level of the student act independently of each other in affecting mechanics of English (CAT) scores of the students and, therefore, are not characterized by a significant interaction effect.

Table 27. Interaction effect of school and ability level on mechanics of English (CAT)

Source of variation	Sum of squares	df	Mean square	F	Signif. level
School X ability-level	73.183	2	36.591	.319	.73
Error	30964.053	270	114.68		
Alpha: .05			.73 is not significant. The hypothesis is retained.		

In mechanics of English, the F value of .319 was found to have a .73 level of significance. Therefore, there was no significant interaction between the schools and ability levels in mechanics of English. The hypothesis is retained.

Hypothesis 60. The factors of school and the ability-level of the student act independently of each other in affecting attitude towards teachers (SOS) scores of the students and, therefore, are not characterized by a significant interaction effect.

Table 28. Interaction effect of school and ability level on attitude towards teachers (SOS)

Source of variation	Sum of squares	df	Mean squares	F	Signif. level
School X ability-level	9.624	2	4.812	.145	.77
Error	8948.0156	270	33.140		
Alpha: .05			.77 is not significant. The hypothesis is retained.		

In attitude towards teachers, the F value of .145 was found to have a .77 level of significance. Therefore, there was no significant interaction between the schools and ability levels in attitude toward teachers. The hypothesis is retained.

Hypothesis 61. The factors of school and ability-level of the students act independently of each other is affecting attitude towards the school educational program (SOS) scores of the students and, therefore, are not characterized by a significant interaction effect.

Table 29. Interaction effect of school and ability level attitude towards the schools' educational program (SOS)

Source of variation	Sum of squares	df	Mean squares	F	Signif. level
School X ability-level	22.453	2	11.226	.202	.72
Error	15000.654	270	55.557		

Alpha: .05

.72 is not significant.
The hypothesis is retained.

In attitude towards the school educational program, the F value of .202 was found to have a .72 level of significance. Therefore, there was no significant interaction between the schools and ability levels in attitude towards the school education program. The hypothesis is retained.

Hypothesis 62. The factors of school and the ability-level of the students act independently of each other in affecting educational value (SOS) scores of the students and, therefore, are not characterized by a significant interaction effect.

Table 30. Interaction effect of school and ability level on educational value test (SOS)

Source of variation	Sum of squares	df	Mean squares	F	Signif. level
School X ability-level	453.773	2	226.886	4.771	.009
Error	12838.529	270	47.550		

Alpha: .05 .009 is significant.
The hypothesis is rejected.

In measuring the interaction effect of school and ability level on the attitude of educational value (SOS) the F value of 4.771 was found to have a .009 level of significance; a value indicating significant interaction. The hypothesis is, therefore, rejected.

There were no significant interactions between schools and ability levels when interpreting the other hypotheses. This indicates that in these accepted hypothesis the differences between the means of the graded school and the nongraded school for the three ability levels were not significantly different form the differences expected, given the marginal means for the ability levels. The reverse of this sentence is true for the school-ability level interaction effect on the attitudinal variable of educational value. Here the interaction mean square is significant; it means that the school effect is not the same for the different ability levels.(Edwards, 1960, p. 184-185).

The variations that existed between the same ability-levels of the two different schools can be seen in Table 31. The negative signs resulted from the decline in favorability of attitudes that occurred between the pre-test and post-test. The significance on the interaction may be more readily seen with the data presented graphically in Figure 4. If the school and ability level interaction were zero, then the two lines (schools) in Figure 4 would have been exactly parallel. The fact that the lines are not parallel indicates that the interaction is significant (Edwards, 1960, p. 186). This significance is apparently due to the difference between the low-ability students and average-ability students in the two schools and then another reversal as the average-ability students are compared with the high-ability students. The variation existing between the ability levels of the two schools becomes more noticeable if the two schools (lines) are compared with the more gradual sloping line connecting the marginal means of the two schools.

The reader should note that the marginal means were not derived by adding the group means listed within Table 31; they were calculated using the raw score totals and the total number of individuals of the various groups.

Table 31. Mean gains for the educational value test (SOS)

	Low-ability	Average-ability	High-ability	
Graded school	-.4	-1.99	-.33	-1.15[a]
Nongraded school	-5.11	-1.27	-.53	-1.78[a]
	-2.69[a]	-1.6[a]	-.42[a]	

[a] Marginal means.

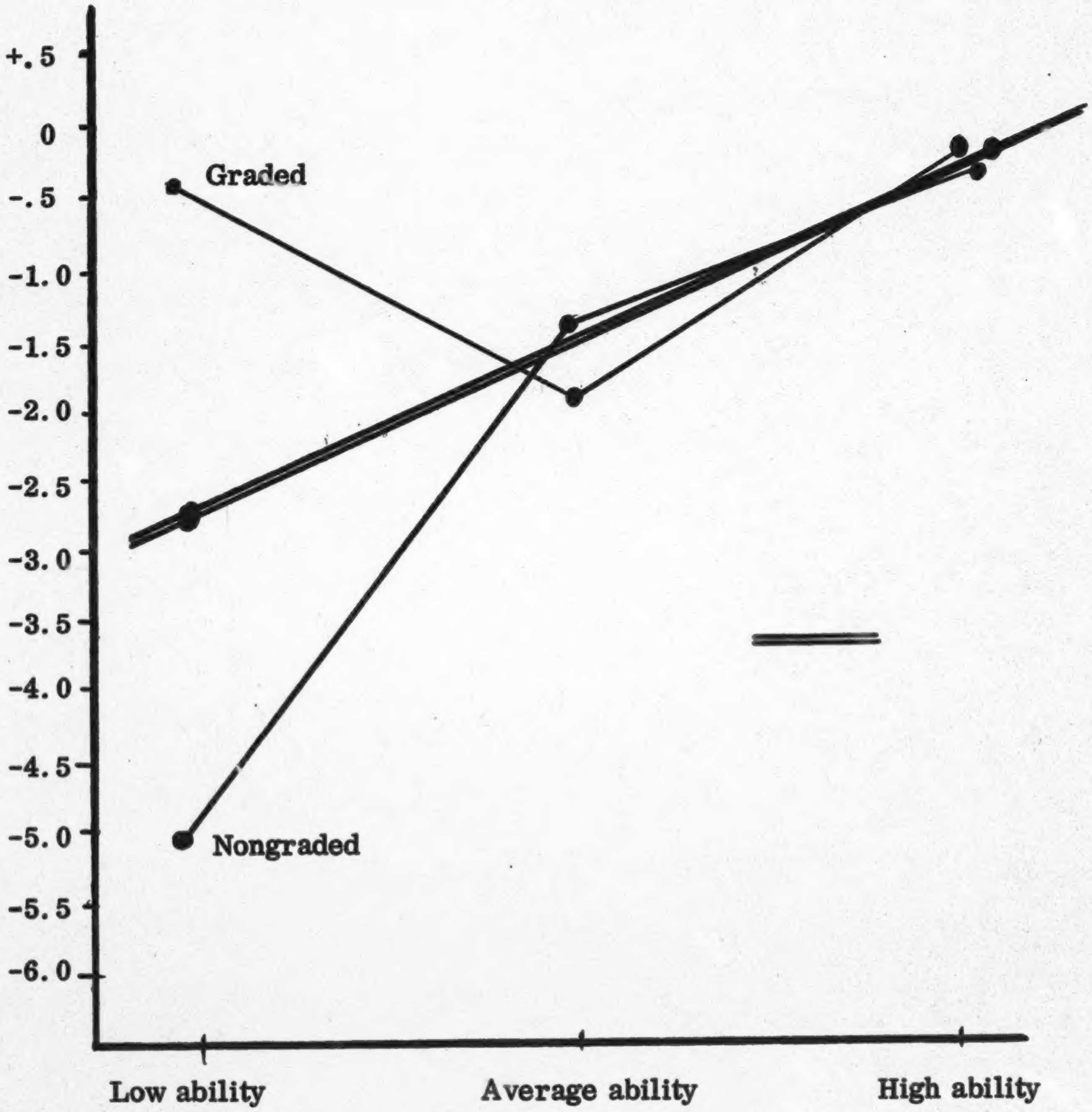

Figure 4. Means for the two schools on the educational value test (SOS) at each ability level, plus the combined mean of both schools for each ability level.

Hypothesis 63. The factors of school and the ability-level of the students act independently of each other in affecting critical thinking (W-G) scores of the students and, therefore, are not characterized by a significant interaction effect.

Table 32. Interaction effect of school and ability level on critical thinking (W-G)

Source of variation	Sum of squares	df	Mean squares	F	Signif. level
School X ability-level	14.468	2	7.234	.128	.88
Error	15253.295	270	56.493		

Alpha: .05

.88 is not significant.
The hypothesis is retained.

In critical thinking, the F value of .128 was found to have a .88 level of significance. Therefore, there was no significant interaction between the schools and ability levels in critical thinking. The hypothesis is retained.

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

Procedure

The purpose of this study was to complete a systematic study of a nongraded secondary school in order to help solve the problem of having too few evaluations of nongradedness. This was done by comparing a first year nongraded school with a control high school of the same city. The hypotheses which were tested in evaluating the nongraded school were based on the assumption that the type of vertical and horizontal organization of the nongraded school would significantly influence student achievement, attitudes, and critical thinking ability.

Sample groups, which numbered 141 for both the nongraded and graded school, were randomly selected from the tenth year students. These students were then stratified by sex and then were placed by I. Q. scores into one of three ability groups designated as low-ability, average-ability, and high-ability. The combination of sexes and ability levels produced six different comparison groups for both schools which were used for comparing the schools on seven dependent variables: three achievement variables, three attitudinal variables, and one relating to critical thinking. Tests for these seven variables were administered both in early October of 1966 and late April of 1967 for the purpose of obtaining and comparing the mean gains of the various like-groups of the two schools. Analysis of variance was employed for obtaining the mean gains of the various comparison groups and for obtaining F ratios used to detect significance in total school comparisons and significant interaction effects. Means of like-groups were compared by using the t test to determine whether the group differences reached the .05 level of significance. In the case of interaction hypotheses and total school comparisons, F values reaching the .05 level were recognized as being significant.

Comparison hypotheses

Reading comprehension. Hypotheses 1 through 6 anticipated that not significant differences would occur between the comparison groups of the graded and nongraded schools in reading comprehension when measured by the California Achievement Test.

No significant differences were found between the like-groups of the nongraded and graded high schools in reading comprehension. All six hypotheses were retained. Though none of the six like-groups of the two schools were found to be significantly different in gain scores, three of the graded school groups made the greatest raw score gains and three of the nongraded groups were found to have made the greatest gains. In testing hypotheses 7, no significant difference was revealed in the total school comparisons.

Mathematic reasoning. Hypotheses 8 through 13 anticipated that no significant differences would occur between the comparison groups of the graded and nongraded schools in mathematic reasoning when measured by the California Achievement Test.

Two of the six comparisons were found to have significant differences. These significant differences favored the low-ability girls and the average-ability girls of the graded school. Though not significantly different, three of the remaining four comparisons favored groups of the graded school. A significant difference, which favored the graded school, was found between the two schools when a total school comparison was made in testing hypothesis fourteen.

Mechanics of English. Hypotheses fifteen through twenty anticipated that no significant differences would occur between the comparison groups of the graded and nongraded schools in mechanics of English when measured by the California Achievement Test.

It was found that there are no significant differences between the like-groups of the nongraded and graded high schools in mechanics of English. All six hypotheses were retained. Though none of the six comparisons was found to be significantly different in gain scores, four of the six groups making the most progress were from the graded high school. No significant difference was found between the two schools when comparing the combined groups in the testing of hypothesis twenty-one.

Attitude towards teachers. Hypotheses twenty-two through twenty-seven anticipated that no significant differences would occur between the comparison groups of the graded and nongraded school in attitude towards teachers when opinions were measured by Borg's Student Opinion Survey.

Opinion survey

No significant differences between the like-groups of the nongraded and graded high schools in attitude towards teachers were found. All six hypotheses were retained. Though none of the differences resulting from the six comparisons reached significance, five of the six groups from the graded high school had the most favorable attitudes towards teachers. No significant difference was found between the two schools when comparing the combined groups in the testing of hypothesis twenty-eight.

Attitude towards the schools' educational program

Hypotheses twenty-nine through thirty-four anticipated that no significant differences would occur between the like-groups of the two schools in attitude towards the schools' educational program when measured by the Student Opinion Survey.

One of the six comparisons was found to have a significant mean gain difference. This significant difference, which favored the graded school, was found between the low-ability girls. Though not significantly different, three of the remaining five comparisons favored the groups from the nongraded school. No significant difference was found between the two schools when comparing the combined groups in the testing of hypothesis thirty-five.

Educational value

Hypotheses thirty-six through forty-one anticipated that no significant differences would occur between the comparison groups of the graded and nongraded schools in how students value education when measured by the Student Opinion Survey.

One of the six comparisons was found to have a significant difference in mean gain scores. This significant difference in mean gain was found to favor the low-ability boys of the graded school. Though not significantly different, three of the remaining five comparisons favored the nongraded school. No significant difference was found between the two schools when comparing the combined groups in the testing of hypothesis forty-two.

Critical thinking

Hypotheses forty-three through forty-eight anticipated that no significant differences would occur in critical thinking ability between the comparison groups of the graded and nongraded schools when measured by the Watson-Glaser Critical Thinking Appraisal.

No significant differences were found between the like-groups of the nongraded and graded high schools in critical thinking ability. All six hypotheses were retained. Though none of the differences resulting from the six comparisons were found to be significant, four of the six groups making the greatest gains were from the nongraded school. No significant difference was found between the two schools when comparing the combined groups in the testing of hypothesis forty-nine.

Interaction hypotheses

Of the fourteen interaction hypotheses which anticipated that the schools and sex and schools and ability levels would act independent of each other, only one was rejected. All of the school and sex interaction hypotheses were retained while one school and ability-level hypothesis displayed a significant F value and was thus rejected. In this case the interaction effect was found to be significant beyond the .0009 level of significance. This significant interaction effect was found in the attitudinal variable of educational value. The effect of this interaction between school and ability-level was evident in two ways: the relatively wide spread between the means of the low-ability students of the two schools in comparison with the average-ability and high-ability students, and the reversal which took place by the most favorable attitude shifting from the graded low-ability students to the nongraded average-ability students and then back to the graded high-ability students.

Additional findings

Although the following findings were synthesized by data observation and not from tested hypotheses, they may prove enlightening to the reader and possibly of benefit to the administration of the two schools.

1. In reading comprehension, both the low-ability boys and the low-ability girls of the graded school made greater raw score gains than did the low-ability groups of the nongraded school. However, the reverse was true

for the high-ability boys and girls, in that the nongraded students made the greater mean gains.

2. The graded students were found to have made greater raw score gains in all but one of the six groups in mathematic reasoning while the nongraded students made the greater progress in critical thinking in four of the six groups.

3. In mechanics of English, the low-ability students of both schools made greater raw score gains when compared with the other higher ability levels.

4. Attitude towards teachers was less favorable at the post-test time than at the pre-test time in four of the six graded groups and in five of the six nongraded groups.

5. The attitude towards the school's educational program was less favorable at the post-test time than at the pre-test time in three of the six groups of the graded school and in five of the six groups of the nongraded school.

6. The value of education to the students slightly declined in favorability in four of the six graded groups and in five of the six nongraded groups.

7. The low-ability students of both schools made greater gains in critical thinking than did the average and high-ability students.

8. Only four of the 42 comparisons indicated groups with significant differences. In each of these four cases, the difference favored the graded school.

9. In twenty-one of the thirty-eight comparisons found to have nonsignificant differences, the greater gain was made by the graded students. Seventeen of the thirty-eight nonsignificant comparisons favored the nongraded students. This data is presented in the appendix.

Conclusions

On the basis of the findings of this study, the following conclusions have been drawn from the results of the forty-nine comparisons. This portion has not the intent of presenting speculations or inferences; rather, it is for the purpose of presenting conclusions that can be soundly deducted from the data of the study.

1. There is no significant difference in the gain in reading comprehension (CAT) when comparing students attending a nongraded high school with students attending a graded high school.

2. There is a significant difference in the gain in mathematic reasoning (CAT) when comparing students attending a graded high school with students attending a nongraded high school. The graded students gained significantly more than did the nongraded students.

3. There is no significant difference in the gain in mechanics of English (CAT) when comparing students attending a nongraded high school with students attending a graded high school.

4. There is no overall significant difference between the attitudes of the graded and nongraded students in that only two of the eighteen

attitudinal comparison proved to be significant and none of the three total-school comparisons was found to be significant.

5. There is no significant difference in the critical thinking ability of the graded and nongraded students.

6. In that only one of the fourteen interaction hypotheses was found to be significant, it is concluded that the overall effect due to interaction between the schools and sex and between the schools and ability level was negligible.

Recommendations

The following recommendations were synthesized from observing the practices and curricula of the two schools and from analyzing the procedures and instruments utilized in this study. These recommendations are of two types: the first being offered primarily for those administrators contemplating the implementation of a nongraded organization in their schools and the second type of recommendation being offered to persons contemplating the initiation of a similar research endeavor or the extension of this particular study.

The problems inherent in the first recommendation is believed by the writer to be the basic cause for the nongraded school not faring better during its first and developmental year of nongradedness. It is further believed by the writer that the rectification of this problem would establish conditions which would allow the staff of the nongraded school to more fully implement an individualized learning program.

1. The number of course offerings in the nongraded school should be greatly reduced.

a. The need existed for the teachers of the nongraded school to develop curricular materials for the 155 courses offered during the first semester. Some teachers did not have the ability, desire, or time to complete this necessary task. Fewer courses would have allowed teachers to develop more closely related materials for two or three sequential phases of one course instead of becoming specialized in isolated courses which were in some cases assigned phase levels according to how the course had been taught in previous years.

b. The number of courses was in part responsible for the teachers not coordinating to a greater degree the development of materials and instructional procedures, that is, teachers of the same discipline were usually teaching different courses and felt little need to coordinate their curricular building endeavors. If in more cases they had been teaching the same course, even though different phases (achievement levels), they would have been more inclined to coordinate their efforts and activities. (This coordination would have undoubtedly encouraged and resulted in greater movement of students to different learning situations (phases), thus allowing for the maintenance of homogenous groupings.)

c. The offering of so many courses handicapped the staff's effort to provide proper phases (achievement levels) for the individual. Many of the courses offered did not materialize due to some courses receiving an insufficient enrollment. The students who had chosen courses and phases which were cancelled had to accept courses and phases not congruent with their desire and past achievement. Such occurrences resulted in (1) heterogenous groupings within the phases, which is not what the teachers and students were promised during the development of the nongraded and appropriate placement program, (2) students' inability to obtain a personalized program, and (3) many classrooms returning to the traditional practice of treating the now heterogenous individuals of the class as a homogenous group.

2. Assuming that experimental schools believe their program will result in better behavorial traits and that they wish their program to be evaluated, school faculties who are considering the implementation of a nongraded organization should identify not only their general "affective" objectives but they should also state the specific behavior objectives for each subject matter area. If these are found to be similar to the behavorial objectives of the control school then the two schools are more compatible for comparing. If the behavorial objectives are different then the experimental school could best be evaluated by comparing a pilot and a control group of the same experimental school, assuming they have the same behavorial objectives.

3. When a computer program becomes available which can employ analysis of covariance in a three-way factoral design with unequal cells (groups), then analysis of variance as a statistical technique should be replaced with analysis of covariance to adjust for the slight I. Q. and pretest differences.

4. Due to the findings that students' attitudes measured toward the close of the school year tend to be less favorable than the same attitude measure during the beginning weeks of the school year, it appears that a attitudinal instruments administered once towards the mid-year of two different school years would be more suitable for comparing attitudes between the students of two schools.

Therefore, it is recommended that attitudes be measured only once each year during the middle of two consecutive academic years.

5. It is recommended that this study be extended for a minimum of two additional years in order to allow time for the staff of the nongraded school to more fully develop and implement their materials and practices.

In closing this study of a high school in its initial year of nongradedness, the reader as well as the researcher, should not conclude that because the nongraded school failed to make significant gains over the graded school that the nongraded movement should be abandoned. Instead the program should be continually adjusted and evaluated and should br given an opportunity to prove its worth.

Again, it is recommended that the nongraded school, the United States Office of Education, and Utah State University continue to cooperate and extend this study over a three-year period before concluding the worth of the nongraded program.

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APPENDIX

Table 33. Nonsignificant difference between like-groups on the seven variables

Group	Reading Comp	Math. Reason.	Mech. of English	Attitude towards teacher	Attitude towards Ed. Prog.	Educational Value	Critical thinking
Graded, low boys	+		+	+		$+^{**}$	+
Nongraded, low boys		+			+		
Graded, average boys	+	+		+	+		
Nongraded, average boys			+			+	+
Graded, high boys		+		+	+	+	+
Nongraded, high boys	+		+				
Graded, low girls	+	$+^{**}$	+		$+^{*}$	+	
Nongraded, low girls				+			+
Graded, average girls		$+^{*}$	+	+			
Nongraded, average girls	+				+	+	+
Graded, high girls		+	+	+			
Nongraded, high girls	+				+	+	+

+ Greater gain, but not significantly.
$+^{*}$ Significant at the .05 level.
$+^{**}$ Significant at the .01 level.

Table 34. Data for groups on reading comprehension

Groups	N	Pre-tests		Post-tests		Difference		Diff. in Schools	t value
		Mean	S. D.	Mean	S. D.	Mean	S. D.		
G, low, boys	11	30.45	7.00	29.45	5.66	1.00	7.13	.14	.057
NG, Low, loys	7	32.57	5.94	31.71	5.59	-.86	7.38		
G, av., boys	26	38.84	6.56	44.27	10.16	-5.42	7.88	1.37	.55
NG, av., boys	39	39.46	6.79	43.51	8.92	-4.05	7.61		
G, high, boys	28	48.39	8.42	57.28	10.19	-8.89	5.12	2.67	1.08
NG, high, boys	23	47.30	4.32	58.87	6.25	-11.56	5.66		
G, low, girls	16	30.56	6.67	31.25	4.85	.69	6.38	1.22	.49
NG, low, girls	19	32.16	5.85	31.63	5.95	-.53	7.22		
G, av., girls	43	37.84	7.42	41,72	9.32	3.88	6.21	.43	.17
NG, av., girls	38	40.16	6.53	44.47	9.25	4.31	6.37		
G, high, girls	17	48.82	6.02	56.41	8.62	7.59	6.01	1.01	.41
NG, high, girls	15	47.60	5.60	56.20	6.93	8.60	4.87		

SE = 2.476

df = 72

t of 2.00 required for significance at the .05 level.

Table 35. Data for groups on mathematic reasoning

		Pre-tests		Post-tests		Difference		Diff. in	
Groups	N	Mean	S.D.	Mean	S.D.	Mean	S.D.	Schools	t value
G, low, boys	11	30.00	8.82	30.54	10.01	.54	3.96	1.03	.49
NG, low, boys	7	29.28	6.26	30.85	7.26	1.57	4.96		
G, av., boys	26	38.42	7.56	42.00	7.35	3.58	4.14	2.32	1.11
NG, av., boys	39	37.64	8.02	38.90	6.95	1.26	6.54		
G, high, boys	28	42.61	8.95	47.46	7.33	4.86	6.70	3.60	1.72
NG, high, boys	23	46.96	6.23	48.22	6.11	1.26	5.31		
G, low, girls	16	28.19	7.88	30.56	7.21	2.37	4.18	5.53	2.65**
NG, low, girls	19	28.63	6.68	25.47	6.41	-3.16	4.79		
G, av., girls	43	32.00	7.97	34.72	8.61	2.72	5.46	4.40	2.11
NG, av., girls	38	35.60	7.87	33.92	8.68	-1.68	6.33		
G, high, girls	17	41.82	7.35	45.65	6.20	3.82	3.57	1.82	.87
NG, high, girls	15	42.67	7.54	44.67	6.67	2.00	5.12		

SE = 2.087
df = 72
*t of 2.00 required for significance at the .05 level.
**t of 2.65 required for significance at the .01 level.

Table 36. Data for groups on mechanics of English

Groups	N	Pre-test		Post-tests		Difference		Diff. in Schools	_t_ value
		Mean	S. D.	Mean	S. D.	Mean	S. D.		
G, Low, boys	11	82.91	13.10	94.45	14.90	11.54	11.52	6.83	1.69
NG, low, boys	7	82.71	9.26	87.43	14.16	4.71	9.09		
G, av., boys	26	97.54	12.99	104.65	16.40	7.11	11.44	.91	.22
NG, av., boys	39	93.31	16.56	101.33	12.08	8.02	11.10		
G, high, boys	28	110.28	13.70	113.36	16.60	3.07	14.96	1.15	.28
NG, high, boys	23	111.13	12.42	115.35	10.00	4.22	10.99		
G, low, girls	16	93.81	13.07	101.50	10.55	7.69	6.48	.90	.22
NG, low, girls	19	91.95	11.52	98.74	11.41	6.79	10.89		
G, av., girls	43	106.19	12.09	112.00	11.77	5.81	9.64	2.94	.73
NG, av., girls	38	105.68	12.85	108.55	11.14	2.87	10.93		
G, high, girls	17	117.18	13.95	125.59	9.23	8.41	7.95	6.34	1.57
NG, high, girls	15	119.33	9.06	121.40	7.50	2.07	5.17		

SE = 4.040
df = 72
_t_ of 2.00 required for significance at the .05 level.

Table 37. Data for groups on attitude towards teachers

Groups	N	Pre-tests		Post-tests		Difference		Schools	_t_ value
		Mean	S. D.	Mean	S. D.	Mean	S. D.		
G, low, boys	11	52.91	4.01	52.09	6.62	-.82	7.31	2.75	1.26
NG, low, boys	7	55.00	4.43	51.43	9.98	-3.57	9.19		
G, av., boys	26	54.11	5.28	53.50	5.14	-.61	5.99	.59	.27
NG, av., boys	39	53.43	4.41	52.23	5.76	-1.20	5.41		
G, high, boys	28	54.18	5.87	54.86	6.32	.68	6.43	1.11	.51
NG, high, boys	23	53.61	5.38	53.17	5.29	-.43	4.09		
G, low, girls	16	55.75	6.83	53.31	4.98	-2.44	5.46	1.76	.80
NG, low, girls	19	53.89	4.01	53.21	6.28	-.68	7.68		
G, av., girls	43	54.00	4.61	53.12	4.77	-.88	4.69	.04	.02
NG, av., girls	38	53.84	4.44	52.92	4.54	-.92	5.71		
G, high, girls	17	55.82	5.45	57.35	5.46	1.53	5.83	1.47	.68
NG, high, girls	15	56.27	3.81	56.33	2.41	.06	4.03		

SE = 2.176
df = 72
_t_ value of 2.00 required for significance at the .05 level.

Table 38. Data for groups on attitude towards the school's educational program

Groups	N	Pre-tests Mean	Pre-tests S. D.	Post-tests Mean	Post-tests S. D.	Difference Mean	Difference S. D.	Diff. in Schools	_t_ value
G, low, boys	11	59.91	5.70	57.00	7.46	-2.91	7.03	3.48	1.24
NG, low, boys	7	59.28	7.56	59.85	7.65	.57	4.86		
G, av., boys	26	57.96	7.20	58.50	5.69	.54	5.80	3.00	1.07
NG, av., boys	39	60.18	6.49	57.71	6.66	-2.46	7.93		
G, high, boys	28	59.86	7.57	60.28	9.05	.42	8.84	.50	.18
NG, high, boys	23	60.78	5.73	60.69	7.46	-.08	8.45		
G, low, girls	16	61.00	8.76	60.00	10.42	1.00	7.89	5.69	2.03
NG, low, girls	19	61.95	5.64	57.26	6.19	-4.69	6.24		
G, av., girls	43	61.39	6.12	58.91	7.08	-2.49	8.09	.97	.35
NG, av., girls	38	60.97	5.39	59.45	5.69	-1.52	6.62		
G, high, girls	17	63.23	8.49	60.41	5.11	-2.82	7.01	1.63	.58
NG, high, girls	15	61.86	5.19	60.67	4.29	-1.19	6.79		

SE = 2.817
df = 72
_t_ value of 2.00 required for significance at the .05 level.

Table 39. Data for groups on the attitude of educational value

Groups	N	Pre-tests		Post-tests		Difference		Diff. in Schools	t value
		Mean	S. D.	Mean	S. D.	Mean	S. D.		
G, low, boys	11	63.09	6.86	65.18	6.08	2.09	7.51	8.23	3.15**
NG, low, boys	7	68.86	8.57	62.71	6.75	-6.14	11.07		
G, av., boys	26	69.42	7.53	65.92	7.57	-3.50	7.41	1.84	.70
NG, av., boys	39	68.51	8.93	66.85	6.76	-1.66	6.77		
G, high, boys	28	66.11	6.57	66.43	7.40	.32	6.80	1.97	.75
NG, high, boys	23	69.69	7.89	68.04	8.19	-1.65	5.99		
G, low, girls	16	65.75	7.66	63.69	9.17	-2.06	7.59	2.68	1.03
NG, low, girls	19	68.05	4.29	63.31	8.02	-4.74	8.70		
G, av., girls	43	67.81	7.85	66.74	7.82	-1.07	5.09	.20	.08
NG, av., girls	38	66.31	6.41	65.45	7.84	-.87	6.56		
G, high, girls	17	69.23	6.29	67.82	9.47	-1.41	7.25	2.60	1.00
NG, high, girls	15	66.00	7.35	67.20	5.77	1.19	6.67		

SE = 2.606
df = 72
* t value of 2.00 required for significance at the .05 level.
** t value of 2.65 required for significance at the 01 level.

Table 40. Data for groups on critical thinking ability

Groups	N	Pre-tests		Post-tests		Difference		Diff. in Schools	t value
		Mean	S. D.	Mean	S. D.	Mean	S. D.		
G, low, boys	11	47.73	7.77	54.09	9.78	6.36	12.94	1.65	.58
NG, low, boys	7	45.71	4.78	50.43	7.68	4.71	5.61		
G, av., boys	26	58.42	8.35	59.42	8.98	1.00	7.14	.46	.16
NG, av., boys	39	59.23	7.44	60.69	7.68	1.46	6.98		
G, high, boys	28	67.28	10.16	69.36	10.58	2.07	5.90	.64	.23
NG, high, boys	23	65.91	8.11	67.35	9.98	1.43	8.90		
G, low, girls	16	49.44	6.90	53.50	6.11	4.06	7.27	.41	.14
NG, low, girls	19	53.26	6.07	57.74	7.33	4.47	9.35		
G, av., girls	43	57.81	7.35	59.21	9.68	1.40	7.39	.81	.29
NG, av., girls	38	60.47	8.22	62.68	7.18	2.21	6.11		
G, high, girls	17	65.06	6.99	68.65	6.73	3.59	7.54	.95	.33
NG, high, girls	15	63.33	8.18	67.87	7.61	4.54	6.68		

SE = 2.841
df = 72
t of 2.00 required for significance at the .05 level.

Questions and Answers
About
NONGRADING
and
RELATED CONCEPTS

HIGH SCHOOL
Las Vegas, Nevada

Q. What is meant by the term non-grading?

A. Non-grading at ___________ High School refers primarily to educational practices based upon the concepts of appropriate placement (a suitable educational "place" for each student) and continuous progress (provision for each student to move at his own best rate).

Q. What is the purpose of non-grading?

A. To provide the most highly individualized learning opportunity possible for each student and eliminate administrative and teaching techniques which tend to keep students "in the same books, doing the same assignments at the same time" regardless of differences in interest, need, and ability.

Q. Do students experience continuous progress in all classes?

A. No. This is an ideal. Some teachers are more skillful and some subjects and students more conducive. However, failure to reach a goal of 100 % does not make the goal unworthy.

Q. Are grade levels really eliminated from the curriculum?

A. Yes. There are no 9th, 10th, 11th or 12th grade courses as such - the entire curruculum has been built largely ignoring age and grade level in order to make all courses available to each student when his interest and need is greatest.

Q. What is meant by phasing?

A. A phase is an achievement level; many courses have five different phases and some are unphased. This is an attempt to provide placement opportunity for students in each course according to interest, achievement and ability.

Q. What is the definition (level) of each phase?

A.

Phase I	For students who lack the basic skills and require special assistance in smaller classes.
Phase II	For students who need special emphasis on basic concepts and skills
Phase III	For students of average achievement in the subject.
Phase IV	For students whose achievement is above average and desire to study the subject in depth.
Phase V	For students with exceptional achievement who desire to study the subject on an advanced level.

Q. Should a student select the same phase in all courses?

A. No. We do not "peg" or "track" students as slow, average, or fast and expect them to do equally well in all subjects. A student may be phase IV in English composition, Phase II in art, Phase V in Algebra, etc.

Q. What criteria are used to aid students in their selection of courses and phases best suited to their needs?

A. a. Standardized tests
b. Previous school achievement in related subjects
c. Teachers' and counselors' evaluations and recommendations

Q. Do students start at phase I and stay in a course until they complete all phases assigned to that course?

A. No. The phases are designed to allow students to be initially placed into proper achievement levels; the phases are not necessarily steps in a learning sequence.

Q. May a student move from one phase to another if the movement is in his interest?

A. Certainly, at certain intervals during each semester.

Q. How often may a student move to another phase?

A. There is relatively little movement, however, students are eligible to move at the beginning and middle of each nine-week quarter.

Q. Who initiates a change of phases?

A. The student.

Q. Doesn't this movement create some administrative inconvenience?

A. Yes.

Q. When a student moves to a new phase, is there a "knowledge gap"?

A. There may be, but there are also "gaps" in the traditional classroom. In order to minimize this gap, our teachers have developed courses of study which help coordinate the presentation of subject matter within and between the different phases.

Q. Will a student remain in a phase until he completely masters all the subject matter even if it takes two or three years?

A. No. Repetition of a course with identical subject matter is of limited value. This is not to say that a student is deprived of this opportunity if it fits his needs. Fewer students fail when they are appropriately placed and provision is made in the instructional program for individualized learning.

Q. Does each phase of a course carry the same amount of credit?

A. Yes.

Q. What is the basis for giving credit?
A. Credit is based on a combination of achievement and time, or special examination.

Q. Can a student receive college credit or advanced placement for work done at ______________ High School in Phases IV and V?
A. Yes. Many students have done well enough on C.E.B. Advanced Placement exams to receive college credit and/or advanced placement at numerous colleges and universities.

Q. Do all phases offer all achievement marks, (A,B,C,D and F)?
A. Yes. However, consistent high grades for a student in a low phase or low grades in a high phase would suggest consideration of an adjustment in phasing for that student in that course.

Q. Is a "B" in phase III worth as much as a "B" in phase V?
A. This can perhaps be answered best by asking if a "B" in general science is equal to a "B" in advanced physics. It depends on whether you're looking at the amount and depth of learning, or whether you are weighing the grades to the student's ability to learn. Whatever the case, the transcript and report card always list the phase and grade of each course taken, plus an interpretation of the meaning of each phase.

Q. What is meant by quest study?
A. This provides students a chance to pursue interests in depth not as readily available in a formal classroom. Arrangements are made by the student with a teacher of the appropriate subject area and the coordinator of independent study.

Q. Are only students in high phases allowed to participate in quest study?
A. No, This program is available to each student who has the interest, desire and ability to work independently regardless of his phase placement.

Q. Why is there a separate registration for each semester?
A. Semester courses offer greater flexibility to the student.

Q. How is registration and scheduling accomplished?
A. Prior to registration day, students are oriented to the course offerings as shown in the course catalog and allowed to make a preliminary choice of subjects and phases. From a compilation of this data a master schedule of courses and phases to be offered is prepared. On registration day each semester, students select courses, phases

and teachers from the master schedule and prepare their own program and schedule. We refer to this as Student self-programing.

Q. Won't some students choose the teachers and classes where there isn't much to do just to get by with as little effort as possible?

A. If there are such students, classes and teachers, they deserve each other. It is our belief that the student is consistently the best judge of his own interest and ability when properly counseled.

Q. Are students really permitted to make the final selection of subject, phase, teacher and time?

A. Yes. In fact, they are required to make these decisions for themselves. They are continually urged to seek counsel in such matters from counselors, teachers, and of course, their parents.

Q. Does experience indicate that student self-programing is valid?

A. Yes. However, we continue to evaluate and modify this and all other aspects of our program.

VITA

Bob F. Steere

Candidate for the Degree of

Doctor of Education

Dissertation: A Comparative Study of a Nongraded and Graded Secondary School as to Achievement, Attitude, and Critical Thinking Ability

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Education: Attended both elementary and secondary school in Cheyenne, Oklahoma; graduated from Cheyenne High School in 1949; received the Bachelor of Science degree from Southwestern State College with majors in Natural Science and Education, in 1956; received the Master of Science degree from Arizona State College in 1961; completed the requirements for the Doctor of Education degree at Utah State University in 1967.

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